SECTION 01000 - GENERAL REQUIREMENTS

1. GENERAL

1.01 SUMMARY OF WORK

A. WORK COVERED BY THE CONTRACT DOCUMENTS CONSISTS OF PROVIDING ALL WORK INDICATED ON DRAWINGS OR REQUIRED BY PROJECT MANUAL DATED FEBRUARY 12, 2004 FOR CSO PROJECT 12.2.

B. THE CONTRACTOR SHALL FURNISH ALL MATERIAL EXCEPT FOR THE WATER METER WHEN REPLACING EXISTING WATER SERVICES.

C. UNFORESEEN UNIDENTIFIED ARCHEOLOGICAL OR CULTURAL RESOURCES: IF PREVIOUSLY UNIDENTIFIED ARCHEOLOGICAL OR CULTURAL RESOURCES ARE ENCOUNTERED DURING STRUCTURAL OR TRENCH EXCAVATION, THE CONTRACTOR SHALL STOP WORK IN THAT AREA IMMEDIATELY AND NOTIFY THE OWNER'S REPRESENTATIVE, THE WILEY & WILSON CONSTRUCTION ADMINISTRATOR, AND THE WILEY & WILSON PROJECT MANAGER. ARCHEOLOGICAL RESOURCES WILL GENERALLY INCLUDE BUT NOT BE LIMITED TO SIGNIFICANT CULTURAL LAYERS CONTAINING CONCENTRATIONS OF BONES, ARTIFACTS, WOODEN OR MASONRY STRUCTURES ALL IN CONSOLIDATED SOILS. IF THE UNIDENTIFIED RESOURCES ARE DEEMED SIGNIFICANT AND REQUIRE STOPPAGE OF WORK AT THE LOCATION FOR MORE THAN 4 HOURS, THE CONTRACTOR WILL BE PAID FOR EQUIPMENT AND PERSONNEL THAT MUST REMAIN IDLE. THE OWNER WILL MAKE EVERY EFFORT TO ALLOW THE CONTRACTOR TO MOVE TO ANOTHER LOCATION ON THE PROJECT AND CONTINUE WORK UNTIL THIS ISSUE IS RESOLVED.

D. IF SOILS CONTAMINATED BY PETROLEUM ARE DISCOVERED DURING CONSTRUCTION, THE CONTRACTOR SHALL CONTACT WILEY & WILSON IMMEDIATELY.

E. IF SOILS CONTAMINATED BY HAZARDOUS MATERIALS ARE DISCOVERED DURING CONSTRUCTION, THE CONTRACTOR SHALL CONTACT WILEY & WILSON IMMEDIATELY.

F. THE CONTRACTOR SHALL COMPLETE WORK IN A LOGICAL SEQUENCE TO MINIMIZE DISRUPTION TO RESIDENTS IN THE PROJECT AREA. ALL UTILITY AND CONCRETE STREET IMPROVEMENTS SHALL BE COMPLETED PRIOR TO FINAL PAVEMENT INSTALLATION. WORK SHALL BE SEQUENCED TO LIMIT CONSTRUCTION TRAFFIC TRAVELING ON NEWLY PAVED AREAS.

G. SUGGESTED SEQUENCE OF CONSTRUCTION:

INSTALL SANITARY SEWER "1" FROM MANHOLE S5 TO S8

INSTALL STORM LINE "J" FROM ENDWALL 84 TO STA 4+60

INSTALL SANITARY SEWER "2" FROM MANHOLE S8 TO S12

INSTALL SANITARY SEWER "3" FROM MANHOLE S10 T0 S16

INSTALL STORM LINE "B" FROM ENDWALL 11 TO INLET 17

INSTALL SANITARY SEWER "2" FROM MANHOLE S12 TO MANHOLE S14

INSTALL STORM LINE "C" FROM MANHOLE 15 TO INLET 22

INSTALL STORM LINE "4" FROM MANHOLE S17 TO MANHOLE S19

INSTALL SANITARY SEWER "A" FROM MANHOLE 1 TO INLET 5

INSTALL SANITARY SEWER "1" FROM MANHOLE S8 TO MANHOLE S21

INSTALL SANITARY SEWER "1" FROM MANHOLE S9A TO MANHOLE S9C

INSTALL STREAM BYPASS FOR CULVERT REPLACEMENT

REPLACE CULVERT FROM ENDWALL 80 TO ENDWALL 84

INSTALL STORM LINE FROM CULVERT TO MANHOLE 85

INSTALL STORM LINE FROM CULVERT TO EXISTING PIPE

REPLACE SANITARY SEWER MANHOLE S1

LINE SANITARY SEWER FROM MANHOLE 7-4-59 TO MANHOLE S5

LINE SANITARY SEWER FROM MANHOLE S12 TO MANHOLE S17

LINE SANITARY SEWER FROM MANHOLE S14 TO MANHOLE S74

INSTALL NEW 12" WATER MAIN FROM TERMINAL POINT NEAR CULVERT ON THOMAS ROAD TO FIRE HYDRANT ON LAKEWOOD STREET, INCLUDING TEMPORARY STUB OVER TO OFF ROAD AREA BETWEEN STAFFORD STREET AND THOMAS ROAD

INSTALL CONCRETE STREET IMPROVEMENTS ON COLLEGE STREET

INSTALL CONCRETE STREET IMPROVEMENTS IN WESTWOOD AVENUE

INSTALL CONCRETE STREET IMPROVEMENTS ON McCAUSLAND STREET FROM COLLEGE STREET TO THOMAS ROAD

INSTALL CONCRETE STREET IMPROVEMENTS ON LAKEWOOD STREET UP TO 404 LAKEWOOD STREET

PROFILE AND OVERLAY COLLEGE STREET, GRADE TO DRAIN THROUGH WESTWOOD STREET INTERSECTION TO ENABLE ABANDONMENT OF EXISTING INLET AS SHOWN

PROFILE AND OVERLAY McCAUSLAND STREET FROM 512 McCAUSLAND TO COLLEGE STREET

PROFILE AND OVERLAY LAKEWOOD STREET UP TO 404 LAKEWOOD STREET

INSTALL SANITARY SEWER "5" FROM MANHOLE S21 TO EXISTING MANHOLE

INSTALL ENDWALL 85A AND LINE STORM SEWER FROM 85A TO INLET 85

INSTALL STORM LINE "D" FROM ENDWALL 26 TO INLET 39

INSTALL SANITARY SEWER "6" FROM MANHOLE S22 TO MANHOLE S31

INSTALL SANITARY SEWER "7" FROM MANHOLE S29 TO MANHOLE S35

INSTALL SANITARY SEWER "9" FROM MANHOLE S25 TO MANHOLE S40

INSTALL STORM LINE "G" FROM ENDWALL 61 TO INLET 66

INSTALL SANITARY SEWER "11" FROM MANHOLE S27 TO MANHOLE S51

INSTALL STORM LINE "K" FROM INLET 85 TO ENDWALL 90

INSTALL SANITARY SEWER "12" FROM MANHOLE S48 TO MANHOLE S56

INSTALL SANITARY SEWER "12" FROM MANHOLE S48 TO MANHOLE S57

INSTALL SANITARY SEWER "9" FROM MANHOLE S40 TO MANHOLE S41

INSTALL STORM LINE "E" FROM INLET 28 TO MANHOLE 54

MAINTAIN LOCAL RESIDENT ACCESS IN ALLEY DURING CONSTRUCTION

INSTALL STORM LINE "F" FROM MAHNOLE 54 TO INLET 83

INSTALL SANITARY SEWER "8" FROM MANHOLE S31 TO MANHOLE S38

MAINTAIN LOCAL RESIDENT ACCESS IN ALLEY DURING CONSTRUCTION

INSTALL STORM LINE "D" FROM MANHOLE 54 TO INLET 43

INSTALL SANITARY SEWER "6" FROM MANHOLE S31 TO S34

INSTALL 8" WATER IN STAFFORD STREET FROM McCAUSLAND STREET TO NEWLAND STREET

INSTALL STORM LINE "D" FROM MANHOLE 30 TO MANHOLE 32

INSTALL CONCRETE STREET IMPROVEMENTS IN STAFFORD STREET

INSTALL CONCRETE STREET IMPROVEMENTS IN NEWLAND STREET

INSTALL SANITARY SEWER "9" FROM MANHOLE S41 TO MANHOLE S42

INSTALL 8" WATER IN NEWBERNE STREET FROM McCAUSLAND STREET TO KINDLEY AVENUE

INSTALL 12" WATER FROM CONNECTION POINT AT NEWBERNE STREET AND KINDLEY AVENUE TO OFF ROAD STUB INSTALLED PREVIOUSLY INCLUDING CONNECTION TO NEW 8" IN NEWBERNE STREET

INSTALL REMAINING CONCRETE STREET IMPROVEMENTS IN LAKEWOOD STREET

INSTALL CONCRETE STREET IMPROVEMENTS IN McCAUSLAND STREET

INSTALL SANITARY SEWER "10" FROM MANHOLE S43 TO MANHOLE S45

INSTALL STORM LINE "D" FROM MANHOLE 32 TO INLET 37

INSTALL SANITARY SEWER "10" FROM MANHOLE S45 TO MANHOLE S47

INSTALL SANITARY SEWER "15" FROM MANHOLE S71 TO MANHOLE S73

INSTALL SANITARY SEWER "15" FROM MANHOLE S71 TO MANHOLE S70

INSTALL MANHOLE S76 IN BREVARD STREET

INSTALL SANITARY MANHOLE S75

REBUILD UPPER SECTION OF THOMAS ROAD TO PROVIDE POSITIVE DRAINAGE INTO NEWBERNE STREET

INSTALL CONCRETE STREET IMPROVEMENTS IN NEWBERNE STREET

INSTALL REMAINING CONCRETE STREET IMPROVEMENTS IN THOMAS ROAD

INSTALL CONCRETE STREET IMPROVEMENTS IN BREVARD STREET

PROFILE AND OVERLAY WESTWOOD AVENUE - PROVIDING POSITIVE DRAINAGE INTO THOMAS ROAD GUTTER AND COLLEGE STREET

PROFILE AND OVERLAY BREVARD STREET

WIDEN, PROFILE, REBUILD, AND OVERLAY THOMAS ROAD AND REMAINING PORTIONS OF LAKEWOOD AND McCAUSLAND STREET - GRADE THOMAS ROAD TO PROVIDE FLOW LINE ACROSS LATERAL STREET INTERSECTIONS TO TRANSPORT GUTTER FLOW ACROSS INTERSECTIONS

WIDEN, PROFILE, AND OVERLAY NEWLAND STREET

WIDEN, PROFILE, AND OVERLAY KINDLEY STREET

REBUILD, PROFILE, AND OVERLAY STAFFORD STREET

REBUILD, PROFILE, AND OVERLAY NEWBERNE STREET

INSTALL SANITARY SEWER FROM MANHOLE S50 TO MANHOLE S59

INSTALL SANITARY SEWER FROM MANHOLE S58 TO MANHOLE S69

INSTALL SANITARY SEWER FROM MANHOLE S50 TO MANHOLE S55

LINE SANITARY SEWER FROM MANHOLE S52 TO MANHOLE 43

GRADE AND STABILIZE DRAINAGE SWALE BEHIND SUSSEX STREET

INSTALL STORM LINE "H" FROM ENDWALL 68 TO INLET 74

INSTALL STORM LINE "DETAIL 1", SHEET 27

LINE EXISTING STORM LINE BETWEEN MANHOLE 72 AND MANHOLE 75

INSTALL SANITARY SEWER FROM MANHOLE S59 TO MANHOLE S65

INSTALL CONCRETE STREET IMPROVEMENTS EDGAR STREET

INSTALL CONCRETE STREET IMPROVEMENTS SUSSEX STREET

WIDEN, PROFILE, AND OVERLAY EDGAR STREET

REBUILD, PROFILE, AND OVERLAY SUSSEX STREET

1.02 PAYMENT

A. APPLICATIONS FOR PAYMENT

(1) EACH APPLICATION FOR PAYMENT SHALL CONSIST OF THE FOLLOWING FORMS:

AIA DOCUMENT G702 ENTITLED, "APPLICATION AND CERTIFICATE FOR PAYMENT" OR SIMILAR APPROVED FORM.

AIA DOCUMENT G703 ENTITLED, "CONTINUATION SHEET."

INVOICES FOR STORED MATERIALS. (PAYMENT FOR STORED MATERIAL DELIVERED BUT NOT INCORPORATED INTO THE WORK WILL BE THE INVOICED AMOUNT ONLY.)

CITY OF LYNCHBURG DBE USAGE STATUS FORM.

REVISED CONSTRUCTION SCHEDULE.

REVISED DISBURSEMENT OF FUNDS SCHEDULE.

(2) EACH APPLICATION FOR PAYMENT BY THE CONTRACTOR, EXCLUDING THE FIRST SHALL ALSO INCLUDE:

AIA DOCUMENT G706 ENTITLED, "CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS."

SUBMISSION OF UP-TO-DATE AS-INSTALLED MARK-UP DRAWINGS TO ENGINEER FOR REVIEW AND APPROVAL.

(3) MONTHLY PARTIAL PAYMENT REQUEST SHALL BE SUBMITTED TO WILEY & WILSON FOR APPROVAL BY THE 25TH OF THE MONTH SO THAT THE OWNER CAN RECEIVE THE APPROVED PAYMENT REQUEST BY THE FIRST WORKING DAY OF THE NEXT MONTH.

(4) THE OWNER WILL MAKE PARTIAL PAYMENTS TO THE CONTRACTOR ON THE LAST BUSINESS DAY OF THE MONTH BY CHECK VIA FIRST CLASS MAIL THROUGH THE U. S. POSTAL SERVICE FOR A DULY CERTIFIED AND APPROVED ESTIMATE OF WORK PERFORMED DURING THE PRECEDING CALENDAR MONTH BY THE CONTRACTOR.

(5) THE OWNER SHALL PAY TO THE CONTRACTOR 95 PERCENT OF THE TOTAL AMOUNT DUE AND THE OWNER SHALL RETAIN 5 PERCENT OF THE AMOUNT DUE UNTIL FINAL COMPLETION AND ACCEPTANCE OF ALL WORK COVERED BY THE CONTRACT.

(6) THE CONTACTOR SHALL AT ALL TIMES EMPLOY SUFFICIENT NUMBER OF WORKMEN FOR THE PROPER PERFORMANCE OF WORK IN THE MANNER AND TIMES SPECIFIED; PREFERENCE BEING GIVEN TO LOCAL LABOR. THE ENGINEER MAY DEMAND THE DISMISSAL OF ANY PERSON OR PERSONS EMPLOYED BY THE CONTRACTOR IN, ABOUT, OR UPON THE WORK, WHO SHALL MISCONDUCT HIMSELF OR BE INCOMPETENT OR HELD NEGLIGENT IN THE PROPER PERFORMANCE OF HIS OR THEIR DUTIES, OR NEGLECTS OR REFUSES TO COMPLY WITH THE DIRECTIONS GIVEN, AND SUCH PERSON OR PERSONS SHALL NOT BE EMPLOYED AGAIN WITHOUT THE WRITTEN CONSENT OF THE ENGINEER. SHOULD THE CONTRACTOR CONTINUE TO EMPLOY OR AGAIN EMPLOY SUCH PERSONS, THE ENGINEER MAY WITHHOLD ALL PAY REQUESTS THAT ARE OR MAY BE DUE, OR THE ENGINEER MAY SUSPEND THE WORK UNTIL SUCH ORDERS ARE COMPLIED WITH. THE CONTRACTOR SHALL FURNISH SUCH EQUIPMENT AS CONSIDERED NECESSARY FOR THE PROPER EXECUTION OF THE WORK IN AN ACCEPTABLE MANNER AND AT A SATISFACTORY RATE OF PROGRESS.

ALL EQUIPMENT, TOOLS, AND MACHINERY USED FOR HANDLING MATERIALS AND EXECUTING ANY PART OF THE WORK SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER AND SHALL BE MAINTAINED IN A SATISFACTORY WORKING CONDITION. THE CONTRACT MAY BE TERMINATED IF THE CONTRACTOR REFUSES TO PROVIDE ADEQUATE EQUIPMENT FOR THE WORK.

(7) THE OWNER WILL WITHHOLD MONTHLY PAYMENT OR PORTIONS THEREOF FOR WORK WHICH FAILS TO COMPLY WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS, INCLUDING COMPLIANCE WITH THE MINIMUM STANDARDS OUTLINED IN THE LATEST EDITION OF THE VIRGINIA EROSION CONTROL HANDBOOK. FAILURE TO MAINTAIN EROSION AND SEDIMENT CONTROL THROUGHOUT THE PROJECT, (INCLUDING THE PROJECT WARRANTY PERIOD), IN COMPLIANCE WITH THESE STANDARDS AS DETERMINED BY THE OWNER OR DESIGNATED REPRESENTATIVE, SHALL RESULT IN DENIAL OF PAY REQUESTS OR PORTIONS THEREOF UNTIL ALL MEASURES HAVE BEEN BROUGHT INTO COMPLIANCE. PAYMENT WILL BE WITHHELD UNTIL THE PROJECT IS DETERMINED BY THE OWNER, OR DESIGNATED REPRESENTATIVE, TO BE IN COMPLIANCE WITH VIRGINIA EROSION CONTROL REGULATIONS. PAYMENT WILL BE RELEASED WITH THE NEXT NORMAL MONTHLY REIMBURSEMENT FOLLOWING COMPLIANCE; NO INTERMEDIATE PAYMENTS WILL BE MADE. WITHHOLDING PAYMENT WILL NOT RELIEVE THE CONTRACTOR OF HIS LEGAL RESPONSIBILITY TO COMPLY WITH THE STATE AND LOCAL EROSION CONTROL REGULATIONS, INCLUDING LIABILITY FOR ANY FINES OR PENALTIES OUTLINED THEREIN.

B. CHANGE ORDER PROCEDURES

(1) NO AMOUNT, IN PART OR IN WHOLE, OF A CHANGE ORDER SHALL BE INCLUDED IN A REQUISITION FOR PAYMENT BY THE CONTRACTOR UNTIL THE CHANGE ORDER HAS BEEN EXECUTED AND COPIES OF THE CHANGE ORDER HAVE BEEN DISTRIBUTED TO THE OWNER AND CONTRACTOR.

(2) WORK ORDERS: A WORK ORDER IS A DEVICE WHICH ENABLES THE OWNER TO PROMPTLY ORDER CHANGES IN COST OR CONTRACT TIME, OR BOTH, PENDING PREPARATION AND EXECUTION OF A FORMAL CHANGE ORDER.

(3) CHANGE NOTICE: THE OWNER MAY REQUEST THE CONTRACTOR TO SUBMIT A CHANGE ORDER PROPOSAL FOR CHANGES IN CONTRACT WORK. THE CONTRACTOR SHALL SUBMIT THE PROPOSAL IN ACCORDANCE WITH CONTRACT REQUIREMENTS WITHIN A REASONABLE TIME. THE OWNER MAY ISSUE TO THE CONTRACTOR A WORK ORDER AUTHORIZING THE REQUIRED CHANGES FOR AN ADDITIONAL AMOUNT NOT TO EXCEED, OR A DEDUCTION OF NOT LESS THAN, THE AMOUNT SHOWN IN THE WORK ORDER. IF THE CONTRACTOR IS NOT IN AGREEMENT WITH THE AMOUNT STIPULATED IN THE WORK ORDER, HE SHALL, WITHIN A REASONABLE TIME AFTER THE ISSUE DATE OF THE ORDER, SUBMIT AN EQUITABLE PROPOSAL AND DEVELOP WITH THE OWNER A MUTUALLY ACCEPTABLE PRICE FOR THE REQUIRED CHANGE IN WORK.

(4) CHANGE ORDER PROPOSAL: WITHOUT FURTHER REQUEST AND WITHIN A REASONABLE TIME FROM THE ISSUE DATE OF A WORK ORDER, THE CONTRACTOR SHALL SUBMIT A WRITTEN CHANGE ORDER PROPOSAL COVERING THE WORK AUTHORIZED IN THE WORK ORDER SO THAT A CHANGE ORDER MAY BE PREPARED FOR EXECUTION.

1.03 DESCRIPTION OF INDIVIDUAL PAY ITEMS INCLUDED ON BID SCHEDULE

A. SANITARY SEWER LINE CONSTRUCTION

(1-8) PRICE PER LINEAR FOOT FOR EACH SIZE DUCTILE IRON SEWER LINE, FOR PRESSURE CLASS 150 FOR 4-INCH THROUGH 12-INCH, AND PRESSURE CLASS 250 FOR 16-INCH THROUGH 24-INCH, COMPLETE IN PLACE TO A MAXIMUM DEPTH OF EXCAVATION OF 8 FEET AND SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT AND LABOR TO EXCAVATE, PROVIDE BEDDING, INSTALL THE PIPE, BACKFILL TO SUBGRADE IF UNDER PAVED AREA OR BACKFILL TO GRADE IF NOT UNDER PAVED AREA, AND TEST THE SEWER LINE. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING BACKFILL AND ANY BYPASS PUMPING AS REQUIRED. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT, SIDEWALK, AND CURB AND GUTTER SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS. DIP FITTINGS ARE PAID FOR SEPARATELY AS REQUIRED.

(9) PRICE PER POUND FOR SEWPER COATED OR EPOXY LINED DUCTILE IRON AND CAST IRON SEWER FITTINGS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL AND TEST ALL TEES, BENDS, PLUGS, WYES AND MISCELLANEOUS MAIN LINE DIP FITTINGS REQUIRED FOR DUCTILE IRON SEWER MAIN INSTALLATION.

(10-15) PRICE PER LINEAR FOOT FOR EACH SIZE SDR-26 (OR SCHEDULE 40) POLYVINYL CHLORIDE (PVC) SEWER LINE COMPLETE IN PLACE TO A MAXIMUM DEPTH OF EXCAVATION OF 8 FEET AND SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO EXCAVATE, PROVIDE BEDDING, INSTALL THE PIPE, BACKFILL TO SUBGRADE IF UNDER PAVED AREA OR BACKFILL TO GRADE IF NOT UNDER PAVED AREA, AND TEST THE SEWER LINE. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING BACKFILL AND ANY BYPASS PUMPING AS REQUIRED. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT, SIDEWALK, AND CURB AND GUTTER SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(16-17) PRICE PER LINEAR FOOT FOR EACH SIZE SCHEDULE 40 DWV PVC SANITARY SEWER SERVICE LATERAL COMPLETE IN PLACE TO A MAXIMUM DEPTH OF EXCAVATION OF 8 FEET. THIS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL THE SERVICE LATERAL AND BACKFILL TO SUBGRADE. THE PRICE SHALL ALSO INCLUDE THE WYE ON THE MAIN SEWER LINE, BEDDING, PIPE, PVC FITTINGS, AND ADAPTERS, BACKFILL AND TESTING. FERNCO COUPLINGS USED UNDER THIS PAY ITEM WILL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(18-19) PRICE PER LINEAR FOOT FOR EACH SIZE OF SCHEDULE 40 DWV PVC SANITARY SEWER CLEANOUT RISER PIPE MEASURED FROM TOP OF WYE TO CAP ELEVATION, COMPLETE IN PLACE SHALL INCLUDE FURNISHING AND INSTALLING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL THE RISER PIPE AND BACKFILL TO GRADE.

(20-21) PRICE FOR EACH SIZE CLEANOUT ASSEMBLY COMPLETE AND IN PLACE SHALL INCLUDE SERVICE CONNECTION WYE, 45-DEGREE BEND, BRASS HEXNUT OR SCORIATED TOP, AND CONNECTION TO THE EXISTING SERVICE LATERAL OR ADAPTER OR PVC PLUG/CAP IF NO EXISTING SERVICE LATERAL EXISTS (DETAIL #27-15). FERNCO COUPLINGS USED UNDER THIS ITEM WILL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(22) PRICE FOR EACH SIZE LAMPSTACK ASSEMBLY COMPLETE AND IN PLACE SHALL INCLUDE THE TWO 45-DEGREE BENDS, CONCRETE COLLAR, AND STANDARD LAMPSTACK FRAME AND COVER COMPLETE AND IN-PLACE, (STANDARD DETAIL 27.13). THIS PAY ITEM WILL INCLUDE ALL FINAL GRADE ADJUSTMENT OF FRAME AND COVER. RISER PIPE WILL BE PAID BY THE VERTICAL FOOT ACCORDING TO PIPE SIZE.

(23-24) PRICE FOR EACH SIZE SANITARY MANHOLE CORE, INCLUDING CORING A HOLE INTO A SANITARY MANHOLE USING A CORE DRILLING MACHINE, PROVIDING AND INSTALLING FLEXIBLE NEOPRENE BOOT AND ADJUSTING BAND TO ENABLE CONNECTION OF SANITARY SEWER TO A MANHOLE. PLUGGING OF EXISTING HOLES WILL BE PAID FOR USING UNFORMED CONCRETE PRICES AS NECESSARY. CORING CONDUCTED FOR CONTRACTOR CONVENIENCE OR DUE TO MIS-FABRICATION OF MANHOLES WILL BE THE CONTRACTOR'S RESPONSIBILITY.

(25-26) PRICE PER VERTICAL FOOT FOR EACH DIAMETER SANITARY SEWER MANHOLE MEASURED FROM INVERT TO BOTTOM ELEVATION OF ADJACENT PAY ITEM. SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO EXCAVATE, PROVIDE BEDDING, INSTALL AND TEST THE NEW MANHOLES AND BACKFILL TO SUBGRADE IF IN PAVED AREA OR BACKFILL TO GRADE IF NOT IN PAVED AREA. PRICE SHALL INCLUDE ALL CONES, REDUCERS, AND FLATTOP ASSEMBLIES AS REQUIRED; DROP CONNECTIONS WILL BE PAID FOR SEPARATELY. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING BACKFILL AND ANY BYPASS PUMPING AS REQUIRED.

(27-28) PRICE PER VERTICAL FOOT FOR EACH SIZE DROP CONNECTION INTO A SANITARY SEWER MANHOLE WITH INSIDE OR OUTSIDE DROP CONNECTION MEASURED FROM LOWER INVERT OF DROP TO CROWN OF UPPER INVERT. PRICE IS TO INCLUDE STRAPPING DROP PIPE TO MANHOLE CASTING (AS APPLICABLE), PLACING CAST IN PLACE CONCRETE, PROVISION AND INSTALLATION OF ALL PIPE, TEES, ELBOWS, PLUGS/CAPS, STONE, BACKFILL AND COMPACTION, FOR EACH DROP ASSEMBLY COMPLETE IN PLACE. THIS ITEM WILL BE USED TO PAY FOR EACH DROP CONNECTION IN A MANHOLE SEPARATELY; THE MANHOLE STRUCTURE WILL BE PAID FOR SEPARATELY IN ACCORDANCE WITH SANITARY MANHOLE PAY ITEM. DROP TO BE CONSTRUCTED IN ACCORDANCE WITH (DETAIL #'S 27.04 AND 27.05). THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING BACKFILL AND ANY BYPASS PUMPING AS REQUIRED.

(29) PRICE FOR EACH MANHOLE FRAME AND COVER SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL THE MANHOLE FRAME AND COVER AT THE APPROPRIATE ELEVATION FOR FINAL PAVING IN PAVED AREAS, OR 2' ABOVE GRADE IN UNDEVELOPED OFF ROAD AREAS. GRADE ADJUSTMENT OVER ONE INCH WILL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS. INCREMENTAL GRADE ADJUSTMENT OF NEWLY INSTALLED MANHOLE FRAMES AND COVERS TO MATCH PAVEMENT PROFILE SHALL BE ACCOMPLISHED TO MATCH FRAME TO FINISHED PAVEMENT PROFILE COST FOR FINAL ADJUSTMENT AND SEALING NEW FRAME AND COVERS SHALL BE INCLUDED IN THIS BID ITEM. ALL MANHOLES SHALL BE ADJUSTED TO PRECISELY MATCH FINAL PAVEMENT SURFACE. (STANDARD DETAIL 27.10).

(30) PRICE FOR EACH WATERPROOF MANHOLE FRAME AND COVER SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL THE WATERPROOF MANHOLE FRAMES AND COVERS IN THE LOCATIONS DESIGNATED ON THE DRAWINGS, UNIT COST SHALL INCLUDE PROVISION FOR GRADE ADJUSTMENT AS REQUIRED. (STANDARD DETAIL 27-11)

(31) PRICE FOR MAKING EACH POINT REPAIR TO AN EXISTING 8-INCH TO 15-INCH SEWER SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO REPAIR EXISTING SEWER UP TO 10 FEET DEEP. THE PRICE SHALL ALSO INCLUDE ALL PIPE, FITTINGS AND APPURTENANCES, BEDDING, BACKFILL AND BYPASS PUMPING FOR REPAIRING OR REPLACING UP TO A 12-FOOT SEGMENT OF SEWER. THE PRICE SHALL INCLUDE ALL EXCAVATION AND BACKFILL. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT, SIDEWALK, AND CURB AND GUTTER. PROVISION OF FERNCO COUPLINGS SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(32) PRICE PER VERTICAL FOOT FOR REHABILITATION OF EXISTING 4- TO 6-FOOT DIAMETER MANHOLE USING WATERPROOF COATING PER SPECIFICATIONS SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO CLEAN AND PREPARE MANHOLE, APPLY AND CURE COATING, INCLUDING ALL DEWATERING AND BYPASS PUMPING AS REQUIRED.

(33-38) PRICE PER LINEAR FOOT FOR REHABILITATION OF EACH SIZE EXISTING SEWER BY THE CURED-IN-PLACE PIPE PROCESS OR FOLDED AND FORMED PROCESS WITH THE INSTALLATION OF A FLEXIBLE LINER SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR. PRICE SHALL ALSO INCLUDE BYPASS PUMPING, PRE-INSERTION CLEANING AND TV INSPECTION, INSERTION AND CURING OF LINER, SEALING LINER AT MANHOLES, TESTING, AND FINAL TV INSPECTION.

(39) PRICE PER CONNECTION FOR RE-ESTABLISHING 4-INCH AND 6-INCH SERVICE CONNECTIONS ALONG SEWER LINES WHICH ARE REHABILITATED BY LINER INSTALLATION INCLUDING CUTTING OUT SERVICE LATERALS USING REMOTE OPERATED CUTTER, MATERIALS, EQUIPMENT, AND LABOR.

B. STORM DRAINAGE CONSTRUCTION

(1-5) PRICE PER LINEAR FOOT FOR EACH SIZE AND CLASS ASTM C 76, REINFORCED CONCRETE PIPE STORM DRAIN COMPLETE IN PLACE WITH A MAXIMUM DEPTH OF EXCAVATION OF 8 FEET SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO EXCAVATE, PROVIDE BEDDING, INSTALL THE STORM DRAIN, AND BACKFILL TO SUBGRADE IF UNDER PAVED AREA OR BACKFILL TO GRADE IF NOT UNDER PAVED AREA. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT, SIDEWALK, AND CURB AND GUTTER SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(6) PRICE PER LINEAR FOOT FOR EACH SIZE DUCTILE IRON PIPE STORM DRAIN, FOR PRESSURE CLASS 350 FOR 12-INCH, AND PRESSURE CLASS 250 FOR 16-INCH THROUGH 30-INCH, COMPLETE IN PLACE TO A MAXIMUM DEPTH OF EXCAVATION OF 8 FEET AND SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO EXCAVATE, PROVIDE BEDDING, INSTALL THE PIPE, BACKFILL TO SUBGRADE IF UNDER PAVED AREA OR BACKFILL TO GRADE IF NOT UNDER PAVED AREA. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT,

SIDEWALK, AND CURB AND GUTTER SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(7) PRICE PER POUND FOR DUCTILE IRON AND CAST IRON FITTINGS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL AND TEST ALL TEES, BENDS, PLUGS, WYES AND MISCELLANEOUS MAIN LINE DIP FITTINGS REQUIRED FOR DUCTILE IRON STORM DRAIN INSTALLATION.

(8) PRICE FOR 84-INCH PRECAST MANHOLE TEE SECTION, WITH A MINIMUM 2-FOOT HIGH 48-INCH RISER CONNECTION, FORMED TO MATCH SLOPES AND DEFLECTIONS SHOWN ON PLANS, SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO EXCAVATE, PROVIDE BEDDING AND BACKFILL, INSTALL THE TEE, AND BACKFILL TO SUBGRADE IF UNDER PAVED AREA OR BACKFILL TO GRADE IF NOT UNDER PAVED AREA.

(9-12) PRICE PER VERTICAL FOOT FOR EACH DIAMETER STORM DRAIN MANHOLE MEASURED FROM INVERT OR TOP OF TEE SECTION TO BOTTOM OF ADJACENT PAY ITEM SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO EXCAVATE, PROVIDE BEDDING AND BACKFILL, INSTALL THE NEW MANHOLES, SHAPE INVERTS, AND BACKFILL TO SUBGRADE IF UNDER PAVED AREA OR BACKFILL TO GRADE IF NOT UNDER PAVED AREA.

(13) PRICE FOR EACH VDOT DI-1 DROP INLET ASSEMBLY WITH AN "H" DIMENSION OF UP TO 2 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE DROP INLET TOP. PRICE SHALL ALSO INCLUDE FURNISHING AND INSTALLING THE FRAME AND GRATE, SHAPING THE INVERT, AND ADJUSTING INLET ELEVATION AND GRADE TO MATCH STREET OR GRADING IMPROVEMENTS. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL.

(14) PRICE PER VERTICAL FOOT FOR EXTRA DEPTH OF VDOT DI-1 DROP INLET BOTTOM FOR THE "H" DIMENSION OVER 2 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT AND LABOR TO FURNISH AND INSTALL THE DROP INLET RISER SECTION AND BASE. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL.

(15) PRICE FOR EACH VDOT DI-2B DROP INLET ASSEMBLY WITH AN "H" DIMENSION OF 2 FEET, AN "L" DIMENSION OF 4 FEET, AND A TYPE A OR B NOSING SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE DROP INLET TOP, INCLUDING PRECAST FLAT-TOP MANHOLE SECTION TO ANCHOR INLET TO RISER SECTION. PRICE SHALL ALSO INCLUDE FURNISHING AND INSTALLING THE FRAME AND GRATE, SHAPING THE INVERT, AND ADJUSTING INLET ELEVATION AND GRADE TO MATCH STREET IMPROVEMENTS. PRICE SHALL INCLUDE EXCAVATION, BEDDING, AND BACKFILL REQUIRED TO PROVIDE STRUCTURAL SUPPORT FOR THE FULL LENGTH OF THE INLET THROAT. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT, SIDEWALK, AND CURB AND GUTTER SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(16) PRICE PER VERTICAL FOOT FOR EXTRA DEPTH OF VDOT DI-2B INLET BOTTOM FOR THE "H" DIMENSION OVER 2 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT AND LABOR TO FURNISH AND INSTALL THE DROP INLET RISER SECTION AND BASE. PRICE SHALL INCLUDE EXCAVATION, BEDDING, AND BACKFILL.

(17) PRICE PER LINEAR FOOT OF EXTRA LENGTH THROAT OPENING OF VDOT DI-2B FOR AN "L" DIMENSION OVER 4 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE EXTRA THROAT LENGTH. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL REQUIRED TO SUPPORT THE EXTRA THROAT LENGTH.

(18) PRICE FOR EACH VDOT DI-2C DROP INLET ASSEMBLY WITH A "H" DIMENSION OF 2 FEET, AN "L" DIMENSION OF 6 FEET, AND A TYPE A OR B NOSING SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE DROP INLET TOP, INCLUDING PRECAST FLAT-TOP MANHOLE SECTION TO ANCHOR INLET TO RISER SECTION. PRICE SHALL INCLUDE FURNISHING AND INSTALLING THE FRAME AND GRATE, SHAPING THE INVERT, AND ADJUSTING INLET ELEVATION AND GRADE TO MATCH STREET IMPROVEMENTS. PRICE SHALL INCLUDE EXCAVATION, BEDDING, AND BACKFILL TO PROVIDE ADEQUATE STRUCTURAL SUPPORT FOR THE FULL LENGTH OF THE INLET THROAT. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT, SIDEWALK, AND CURB AND GUTTER SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(19) PRICE PER VERTICAL FOOT FOR EXTRA DEPTH OF VDOT DI-2C DROP INLET BOTTOM FOR THE "H" DIMENSION OVER 2 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE DROP INLET RISER SECTION AND BASE. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL.

(20) PRICE PER LINEAR FOOT OF EXTRA LENGTH THROAT OPENING OF VDOT DI-2C FOR AN "L" DIMENSION OVER 6 FEET SHALL INCLUDE ALL EQUIPMENT, MATERIAL, AND LABOR TO FURNISH AND INSTALL THE EXTRA THROAT LENGTH. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL REQUIRED TO SUPPORT THE EXTRA THROAT LENGTH.

(21) PRICE FOR EACH VDOT DI-3B DROP INLET TOP WITH AN "H" DIMENSION OF 2 FEET, AN "L" DIMENSION OF 6 FEET, AND A TYPE A OR B NOSING SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE DROP INLET TOP, INCLUDING PRECAST FLAT-TOP MANHOLE SECTION TO ANCHOR INLET TO RISER SECTION. PRICE SHALL INCLUDE SHAPING THE INVERT, AND ADJUSTING INLET ELEVATION AND GRADE TO MATCH STREET IMPROVEMENTS. PRICE SHALL INCLUDE EXCAVATION, BEDDING, AND BACKFILL TO PROVIDE ADEQUATE STRUCTURAL SUPPORT FOR THE FULL LENGTH OF THE INLET THROAT. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT, SIDEWALK, AND CURB AND GUTTER SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(22) PRICE PER VERTICAL FOOT FOR EXTRA DEPTH OF VDOT DI-3B DROP INLET BOTTOM FOR THE "H" DIMENSION OVER 2 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT AND LABOR TO FURNISH AND INSTALL THE DROP RISER SECTION AND BASE. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL.

(23) PRICE PER LINEAR FOOT OF EXTRA LENGTH THROAT OPENING OF VDOT DI-3B FOR AN "L" DIMENSION OVER 4 FEET SHALL INCLUDE ALL EQUIPMENT, MATERIAL, AND LABOR TO FURNISH AND INSTALL THE EXTRA THROAT LENGTH. PRICE SHALL ALSO INCLUDE

EXCAVATION, BEDDING, AND BACKFILL REQUIRED TO SUPPORT THE EXTRA THROAT LENGTH.

(24) PRICE FOR EACH VDOT DI-3C DROP INLET TOP WITH AN "H" DIMENSION OF 2 FEET, AN "L" DIMENSION OF 6 FEET, AND A TYPE A OR B NOSING SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE DROP INLET TOP, INCLUDING PRECAST FLAT-TOP MANHOLE SECTION TO ANCHOR INLET TO RISER SECTION. PRICE SHALL ALSO INCLUDE SHAPING THE INVERT, AND ADJUSTING INLET ELEVATION AND GRADE TO MATCH STREET IMPROVEMENTS. PRICE SHALL INCLUDE EXCAVATION, BEDDING, AND BACKFILL TO PROVIDE ADEQUATE STRUCTURAL SUPPORT FOR THE FULL LENGTH OF THE INLET THROAT. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT, SIDEWALK, AND CURB AND GUTTER SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(25) PRICE PER VERTICAL FOOT FOR EXTRA DEPTH OF VDOT DI-3C DROP INLET BOTTOM FOR THE "H" DIMENSION OVER 2 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT AND LABOR TO FURNISH AND INSTALL THE DROP INLET RISER SECTION AND BASE. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL.

(26) PRICE PER LINEAR FOOT OF EXTRA LENGTH THROAT OPENING OF VDOT DI-3C FOR AN "L" DIMENSION OVER 6 FEET SHALL INCLUDE ALL EQUIPMENT, MATERIAL, AND LABOR TO FURNISH AND INSTALL THE EXTRA THROAT LENGTH. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL REQUIRED TO SUPPORT THE EXTRA THROAT LENGTH.

(27) PRICE FOR EACH VDOT DI-5 OR DI-7 DROP INLET TOP WITH AN "H" DIMENSION OF UP TO 2 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE DROP INLET TOP. PRICE SHALL ALSO INCLUDE FURNISHING AND INSTALLING THE FRAME AND GRATE AND SHAPING THE INVERT. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL.

(28) PRICE PER VERTICAL FOOT FOR EXTRA DEPTH OF VDOT DI-5 OR DI-7 DROP INLET BOTTOM FOR THE "H" DIMENSION OVER 2 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE DROP INLET RISER SECTION AND BASE. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL.

(29-34) PRICE FOR EACH SIZE VDOT ALTERNATE ES-1 FLARED END SECTION FOR REINFORCED CONCRETE PIPE SHALL INCLUDE ALL EQUIPMENT, MATERIALS, AND LABOR TO FURNISH AND INSTALL EACH END SECTION. PRICE SHALL ALSO INCLUDE ALL EXCAVATION, BEDDING, AND BACKFILL.

(35-38) PRICE FOR EACH SIZE VDOT EW-1 OR EW-2 PRECAST END WALL FOR REINFORCED CONCRETE PIPE SHALL INCLUDE ALL EQUIPMENT, MATERIALS, AND LABOR TO FURNISH AND INSTALL EACH END WALL. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, GROUTING AND BACKFILL.

(39) PRICE FOR VDOT EW-11APC PRECAST ENDWALL WITH LOAD CARRYING GRATE FOR 24-INCH REINFORCED CONCRETE PIPE SHALL INCLUDE ALL EQUIPMENT, MATERIALS, AND LABOR TO FURNISH AND INSTALL EACH ENDWALL AND DEBRIS GRADE. PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, GROUTING, AND BACKFILL.

(40) PRICE FOR EACH MANHOLE FRAME AND COVER SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL THE MANHOLE FRAME AND COVER AT THE APPROPRIATE ELEVATION FOR FINAL PAVING IN PAVED AREAS, OR 2' ABOVE GRADE IN UNDEVELOPED OFF ROAD AREAS. GRADE ADJUSTMENT OVER ONE INCH WILL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS. INCREMENTAL GRADE ADJUSTMENT OF NEWLY INSTALLED MANHOLE FRAMES AND COVERS TO MATCH PAVEMENT PROFILE SHALL BE ACCOMPLISHED TO MATCH FRAME TO FINISHED PAVEMENT PROFILE COST FOR FINAL ADJUSTMENT AND SEALING NEW FRAME AND COVERS SHALL BE INCLUDED IN THIS BID ITEM. ALL MANHOLES SHALL BE ADJUSTED TO PRECISELY MATCH FINAL PAVEMENT SURFACE. (STANDARD DETAIL 27.10 - NOTE SUBSTITUTE "STORM" FOR "SANITARY" IN COVER MARKING DETAIL).

(41) PRICE FOR EACH EXISTING VDOT STANDARD DROP INLET TOP TO BE REMOVED AND REINSTALLED IN A NEW BASE SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO REMOVE AND REINSTALL EXISTING DI-1, DI-2, OR DI-3 TOPS WHERE DESIGNATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THE DROP INLET TOPS THAT ARE NOT REINSTALLED ON THE PROJECT SHALL BECOME THE PROPERTY OF THE CITY. COST FOR NEW BASE SHALL BE PAID AS EXTRA DEPTH UNDER APPROPRIATE INLET TYPE

C. WATER LINE CONSTRUCTION

(1) PRICE PER LINEAR FOOT FOR 2-INCH TYPE K COPPER PIPE COMPLETE IN PLACE WITH A MINIMUM COVER OF 3 FEET AND A MAXIMUM EXCAVATION OF 8 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO EXCAVATE, INSTALL PIPE INCLUDING PROVISION OF BEDDING AND BACKFILL, TEST, DISINFECT, AND BACKFILL THE WATER LINE TO SUBGRADE.

(2-4) PRICE PER LINEAR FOOT FOR EACH SIZE DUCTILE IRON WATER MAIN, COMPLETE IN PLACE WITH A MAXIMUM EXCAVATION OF 8 FEET SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO EXCAVATE, PROVIDE BEDDING, INSTALL, TEST, DISINFECT, AND BACKFILL THE WATER LINE TO SUBGRADE. REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT, SIDEWALK, AND CURB AND GUTTER SHALL BE PAID FOR SEPARATELY UNDER SCHEDULE D ITEMS.

(5) PRICE PER POUND FOR DUCTILE IRON AND CAST IRON FITTINGS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL, TEST, AND DISINFECT ALL TEES, BENDS, PLUGS, CAPS, CROSSES, SLEEVES, REDUCERS, AND MISCELLANEOUS FITTINGS NOT SPECIFICALLY IDENTIFIED AS A PAY ITEM. PRICE FOR ALL TYPES OF JOINT RESTRAINTS EXCEPT CONCRETE ANCHORS AND JOINT RESTRAINTS ON FIRE HYDRANT ASSEMBLIES SHALL BE INCLUDED IN THIS ITEM. PRICES FOR VALVES, VALVE BOXES, AND FITTINGS ASSOCIATED WITH FIRE HYDRANT ASSEMBLIES SHALL NOT BE INCLUDED IN THIS BID ITEM.

(6-8) PRICE FOR EACH SIZE VALVE AND VALVE BOX SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL, TEST AND DISINFECT EACH VALVE AND VALVE BOX. EITHER GATE VALVES OR BUTTERFLY VALVES MAY BE FURNISHED EXCEPT GATE VALVES SHALL BE USED FOR FIRE HYDRANT ASSEMBLIES. PRICE FOR THIS ITEM SHALL INCLUDE FINAL GRADE ADJUSTMENT DURING

PAVING OPERATIONS TO PRECISELY MATCH FINAL GRADE INCLUDING PROVISION OF CONCRETE STABILIZING COLLAR PER STANDARD DETAILS.

(9-10) PRICE FOR EACH SIZE WET TAP BASED ON SIZE OF TAPPING VALVE SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT AND LABOR TO MAKE A WET TAP ON AN EXISTING WATER LINE. THE PRICE SHALL INCLUDE PROVISION OF THE TAPPING MACHINE, THE SLEEVE, VALVE, VALVE BOX, AND ALL ACCESSORIES AND LABOR TO OPERATE THE TAPPING MACHINE.

(11) PRICE FOR EACH 2-INCH CORPORATION STOP, TAPPING SADDLE, CURB COCK AND VALVE BOX SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL, TEST, AND DISINFECT EACH CORPORATION STOP ASSEMBLY.

(12) PRICE FOR EACH 2-INCH COUPLING SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL, TEST, AND DISINFECT EACH COUPLING.

(13) PRICE TO INSTALL EACH COMBINATION 1-INCH AIR AND VACUUM RELEASE ASSEMBLY, INCLUDING FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL A 1-INCH CORPORATION STOP, BRASS NIPPLE, AIR AND VACUUM RELEASE VALVE, AND TWO BRASS STREET ELLS WITH THREADED BRASS INSECT SCREEN ON A WATER LINE. PRICE SHALL INCLUDE THE CONCRETE MANHOLE ASSEMBLY COMPLETE AND IN PLACE PER STANDARD DRAWING. PRICE SHALL INCLUDE ALL EXCAVATION, BEDDING, AND BACKFILL REQUIRED FOR THE INSTALLATION.

(14) PRICE PER LINEAR FOOT FOR REPLACING 3/4-INCH OR 1-INCH WATER SERVICE (ON CITY RIGHT OF WAY) SHALL INCLUDE FURNISHING ALL COPPER PIPE AND FITTINGS FROM THE WATER LINE TO THE APPROXIMATE LOCATION OF EXISTING METER BOX AT THE EDGE OF THE RIGHT OF WAY. PRICE SHALL ALSO INCLUDE EXCAVATION AND BACKFILL FOR THE WATER SERVICE.

(15) PRICE PER LINEAR FOOT FOR REPLACING 3/4-INCH OR 1-INCH WATER SERVICE (ON PRIVATE PROPERTY) AS DIRECTED BY OWNER SHALL INCLUDE FURNISHING ALL COPPER PIPE AND FITTINGS FROM METER BOX TO THE LOCATION SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER. THE PRICE SHALL INCLUDE ALL EQUIPMENT, LABOR, TESTING, DISINFECTION, PROPERTY RESTORATION, AND CONNECTION TO EXISTING SERVICE AT HOUSE. A CERTIFIED PLUMBER MUST PERFORM WORK UNDER THIS PAY ITEM. PRICE SHALL ALSO INCLUDE EXCAVATION AND BACKFILL FOR THE WATER SERVICE.

(16) PRICE FOR EACH METER BOX REPLACEMENT SHALL INCLUDE FURNISHING AND INSTALLING NEW METER BOX AND YOKE AND REMOVING THE EXISTING METER BOX AND YOKE AND DELIVERY TO THE CITY STORAGE YARD. THE CONTRACTOR SHALL RESET THE EXISTING METER FROM THE OLD SERVICE TO THE NEW SERVICE. THE PRICE SHALL INCLUDE ALL EQUIPMENT, MATERIAL, AND LABOR FOR CONNECTING TO THE NEW WATER LINE, CONNECTING TO THE EXISTING SERVICE BEYOND THE METER BOX, AND ALL TESTING AND DISINFECTION OF THE ENTIRE NEW SERVICE CONNECTION PIPING THAT IS INSTALLED FOR EACH PROPERTY). PRICE SHALL ALSO INCLUDE EXCAVATION, BEDDING, AND BACKFILL FOR THE METER BOX REPLACEMENTS.

(17) PRICE FOR EACH FIRE HYDRANT SHALL INCLUDE FURNISHING ALL MATERIALS, EQUIPMENT, AND LABOR TO REMOVE THE EXISTING FIRE HYDRANT AND INSTALL A NEW FIRE HYDRANT INCLUDING ANCHORS, RESTRAINTS, STONE, BACKFILL, CONCRETE PAD, TESTING AND DISINFECTION.

(18) PRICE FOR EACH FIRE HYDRANT ASSEMBLY SHALL INCLUDE FURNISHING ALL MATERIALS, EQUIPMENT, AND LABOR TO INSTALL A FIRE HYDRANT ASSEMBLY IN ACCORDANCE WITH STANDARD DETAIL INCLUDING HYDRANT, VALVE, VALVE BOX, ANCHORS, RESTRAINTS, STONE, BACKFILL, CONCRETE PAD, TESTING AND DISINFECTION. THE PIPE FROM THE MAIN LINE TO THE HYDRANT WILL NOT BE PAID FOR UNDER THIS ITEM). PRICE SHALL ALSO INCLUDE EXCAVATION AND BACKFILL FOR THE FIRE HYDRANT ASSEMBLY.

D. MISCELLANEOUS ITEMS APPLICABLE TO WATER, SANITARY, AND STORM SEWER LINE CONSTRUCTION.

(1) PRICE FOR ROCK EXCAVATION BY BLASTING SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR REQUIRED TO EXCAVATE MATERIAL AND PROVIDE BACKFILL TO FULL DEPTH SHOWN ON PLANS THAT, IN THE OPINION OF THE ENGINEER, CANNOT BE EXCAVATED EXCEPT BY DRILLING AND BLASTING, OR WEDGING. QUANTITIES WILL BE DETERMINED BASED ON FIELD CONDITIONS IN ACCORDANCE WITH SPECIFICATIONS.

(2) PRICE FOR ROCK EXCAVATION BY "HOE-RAMMING" SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR REQUIRED TO EXCAVATE MATERIAL AND PROVIDE BACKFILL TO FULL DEPTH SHOWN ON PLANS BY "HOE-RAMMING" AS DIRECTED BY THE ENGINEER. ROCK SHALL CONSIST OF UNDECOMPOSED STONE, HARD ENOUGH TO RING UNDER HAMMER AND OF A VOLUME NOT LESS THAN 1/2 CUBIC YARD. THE CONTRACTOR AND ENGINEER SHALL MEASURE THE ROCK IN PLACE BEFORE BEING EXCAVATED.

(3) PRICE PER CUBIC YARD FOR COMMON EXCAVATION SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR REQUIRED TO EXCAVATE AND SHAPE IN-PLACE SOILS WHERE SHOWN ON THE CONSTRUCTION DRAWINGS AND/OR AS DIRECTED BY THE ENGINEER. COMMON EXCAVATION SHALL NOT INCLUDE THE FOLLOWING: ROCK EXCAVATION, EXCAVATION NECESSARY TO REMOVE EXISTING STRUCTURES, OR EXCAVATION FOR UTILITIES OR STREET IMPROVEMENTS WHICH ARE INCLUDED IN OTHER PAY ITEMS.

(4) PRICE PER CUBIC YARD FOR EXTRA DEPTH TRENCH EXCAVATION FROM 8 FEET TO 16 FEET DEEP SHALL INCLUDE MATERIAL, EQUIPMENT, AND LABOR REQUIRED TO EXCAVATE FOR TRENCHES FROM 8 TO 16 FEET DEEP WHERE SHOWN ON THE CONSTRUCTION DRAWINGS AND/OR AS DIRECTED BY THE ENGINEER. THE PRICE SHALL ALSO INCLUDE ALL SHORING, DEWATERING, TRAFFIC CONTROL, AND SAFETY DEVICES REQUIRED BY THE JURISDICTIONS HAVING AUTHORITY. UNIT PRICE FOR ROCK EXCAVATION SHALL INCLUDE PROVISIONS FOR REMOVAL OF MATERIAL AT EXTRA DEPTHS AS REQUIRED AND THIS PAY ITEM WILL NOT BE USED WHEN EXCAVATING ROCK BY BLASTING OR HOE-RAMMING.

(5) PRICE PER CUBIC YARD FOR EXTRA DEPTH TRENCH EXCAVATION GREATER THAN 16 FEET DEEP SHALL INCLUDE MATERIAL,

EQUIPMENT, AND LABOR REQUIRED TO EXCAVATE FOR TRENCHES GREATER THAN 16 FEET DEEP WHERE SHOWN ON THE CONSTRUCTION DRAWINGS AND/OR AS DIRECTED BY THE ENGINEER. THE PRICE SHALL ALSO INCLUDE ALL SHORING, DEWATERING, TRAFFIC CONTROL, AND SAFETY DEVICES REQUIRED BY THE JURISDICTIONS HAVING AUTHORITY. UNIT PRICE FOR ROCK EXCAVATION SHALL INCLUDE PROVISIONS FOR REMOVAL OF MATERIAL AT EXTRA DEPTHS AS REQUIRED AND THIS PAY ITEM WILL NOT BE USED WHEN EXCAVATING ROCK BY BLASTING OR HOE RAMMING.

(6) PRICE FOR EACH MANHOLE OR DROP INLET ABANDONMENT SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR REQUIRED TO FILL ALL PIPES ENTERING AND EXITING THE MANHOLE WITH FLOWABLE FILL, REMOVING THE UPPER PORTION OF THE MANHOLE TO A MINIMUM OF TWO FEET BELOW THE PROPOSED FINISHED GRADE, BREAKING A 6-INCH HOLE IN THE BOTTOM OF THE STRUCTURE, AND BACKFILLING THE STRUCTURE WITH VDOT #57 STONE COMPACTED IN 6-INCH LIFTS. THE REMAINING PORTION SHALL BE BACKFILLED WITH STONE OR ASPHALT TO MATCH ROADWAY CROSS-SECTION IF IN A ROAD AREA, IN OFF-ROAD AREAS, AASHTO TYPE III GEOTEXTILE WILL BE LAID ON THE STONE BASE AND SUITABLE SOIL MATERIAL COMPACTED ON TOP TO MATCH SURROUNDING GRADE.

(7) PRICE PER IN-PLACE CUBIC YARD FOR SELECT BORROW SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR REQUIRED TO FURNISH, HAUL, PLACE, COMPACT, AND GRADE MATERIAL APPROVED BY THE ENGINEER. THE SELECT BORROW SHALL BE USED IN THE LOCATIONS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND/OR AS DIRECTED BY THE ENGINEER. NATIVE SOIL SHALL BE PRESERVED FOR REUSE AS FILL WITHIN THE PROJECT AREA AND WILL NOT BE PAID FOR AS SELECT BORROW. SELECT BORROW MAY INCLUDE STRUCTURAL FILL, NON-STRUCTURAL FILL, AND TOPSOIL MATERIALS.

(8) PRICE PER CUBIC YARD FOR VDOT CLASS A3 CONCRETE POURED WITHOUT FORMS FOR REACTION ANCHORS, COLLARS, FOOTINGS, AND SO FORTH SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO PLACE THE CONCRETE IN THE LOCATIONS SHOWN ON THE CONSTRUCTION DRAWINGS AND/OR AS DIRECTED BY THE ENGINEER.

(9) PRICE PER CUBIC YARD FOR VDOT CLASS A3 CONCRETE POURED WITH FORMS FOR VAULTS, HEADWALLS, AND SO FORTH SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO PLACE THE CONCRETE IN THE LOCATIONS SHOWN ON THE CONSTRUCTION DRAWINGS AND/OR AS DIRECTED BY THE ENGINEER.

(10) PRICE PER SQUARE YARD FOR VDOT CLASS A3 CONCRETE POURED FOR 4-INCH THICK SIDEWALK REPAIRS SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO PLACE THE CONCRETE IN THE LOCATIONS SHOWN ON THE CONSTRUCTION DRAWINGS AND/OR AS DIRECTED BY THE ENGINEER. THE PRICE SHALL INCLUDE REMOVAL AND DISPOSAL OF EXISTING CONCRETE SIDEWALK.

(11) PRICE PER SQUARE YARD FOR VDOT CLASS A3 CONCRETE POURED FOR 6-INCH THICK DRIVEWAYS, DRIVEWAY ENTRANCES, V-DITCHES, AND SIDEWALK REPAIRS SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO PLACE THE CONCRETE IN THE LOCATIONS SHOWN ON THE CONSTRUCTION DRAWINGS AND/OR AS DIRECTED BY THE ENGINEER. THE PRICE SHALL INCLUDE REMOVAL AND DISPOSAL OF EXISTING

CONCRETE DRIVEWAYS, DRIVEWAY ENTRANCES, V-DITCHES, SIDEWALKS AND CURB & GUTTER SECTIONS.

(12) PRICE PER POUND FOR REINFORCING STEEL AND TIE RODS FOR REINFORCED CONCRETE WORK SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE REINFORCEMENT.

(13) PRICE PER SQUARE YARD FOR WELDED WIRE FABRIC (6" X 6", 10 GAGE) FOR CONCRETE WORK SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL THE WELDED WIRE FABRIC.

(14) PRICE PER SQUARE YARD FOR REINFORCED CONCRETE PAVEMENT REMOVAL SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO SAW CUT PAVEMENT, REMOVE AND DISPOSE OF REINFORCED CONCRETE PAVEMENT USING CONCRETE REMOVAL EQUIPMENT SUCH AS CONCRETE SAWS, JAW CRUSHERS, AND HYDRAULIC BREAKERS. INCIDENTAL CONCRETE PAVEMENT REMOVED WITH CONVENTIONAL EXCAVATION EQUIPMENT WILL BE CONSIDERED INCIDENTAL TO OTHER PAY ITEMS, OR PAID FOR AS PAVEMENT REMOVAL.

(15) PRICE PER LINEAR FOOT FOR CURB AND GUTTER REMOVAL SHALL INCLUDE ALL MATERIAL, EQUIPMENT AND LABOR TO REMOVE AND DISPOSE OF CONCRETE CURB AND/OR CURB AND GUTTER.

(16) PRICE FOR REMOVAL OF EACH TREE WHERE SPECIFICALLY NOTED ON THE DRAWINGS SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO REMOVE AND DISPOSE OF TREES 6-15 INCHES IN DIAMETER MEASURED 4 FEET FROM THE GROUND, INCLUDING STUMP AND ROOT STRUCTURE AS DIRECTED BY ENGINEER. THE COST TO REMOVE AND DISPOSE OF SMALLER TREES SHALL BE CONSIDERED INCIDENTAL TO OTHER BID ITEMS AND FACTORED IN THEIR UNIT PRICES.

(17) PRICE FOR REMOVAL OF EACH TREE WHERE SPECIFICALLY NOTED ON THE DRAWINGS SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO REMOVE AND DISPOSE OF TREES OVER 15 INCHES IN DIAMETER MEASURED 4 FEET FROM THE GROUND, INCLUDING STUMP AND ROOT STRUCTURE AS DIRECTED BY ENGINEER.

(18) PRICE PER ACRE FOR CLEARING AND GRUBBING IN LIGHTLY WOODED AREAS SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR REQUIRED TO CLEAR AND GRUB LIGHTLY WOODED AREAS IN ACCORDANCE WITH THE PROVISIONS OF THE CONSTRUCTION SPECIFICATIONS. LIGHTLY WOODED AREAS WILL BE DEFINED AS AREAS WHERE MORE THAN 15 PERCENT OF THE TREES ARE OVER 4 INCHES IN DIAMETER AND TO NO MORE THAN 15% ARE 12 INCHES OR MORE IN DIAMETER. THE PRICE SHALL ALSO INCLUDE THE REMOVAL AND DISPOSAL OF ITEMS THAT CANNOT BE MULCHED OR BUILT INTO BRUSH PILES.

(19) PRICE PER ACRE FOR CLEARING AND GRUBBING IN HEAVILY WOODED AREAS SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR REQUIRED TO CLEAR AND GRUB HEAVILY WOODED AREAS IN ACCORDANCE WITH THE PROVISIONS OF THE CONSTRUCTION SPECIFICATIONS. HEAVILY WOODED AREAS WILL BE DEFINED AS AREAS WHERE MORE THAN 15 PERCENT OF THE TREES ARE 12 INCHES OR GREATER IN DIAMETER. THE PRICE SHALL ALSO INCLUDE THE

REMOVAL AND DISPOSAL OF ITEMS THAT CANNOT BE MULCHED OR BUILT INTO BRUSH PILES.

(20) PRICE PER TON FOR DENSE GRADED AGGREGATE FILL SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO FURNISH AND INSTALL TYPE I - VDOT #21 OR #21A STONE IN THE LOCATIONS DESIGNATED BY THE ENGINEER. VDOT #21 OR #21A STONE USED AS TEMPORARY BASE MATERIAL FOR STREETS TO BE SURFACE TREATED WILL BE PAID FOR WITH THIS BID ITEM. VDOT #21 OR #21A STONE USED IN TEMPORARY TRENCH PATCHES WILL BE PAID FOR WITH THIS BID ITEM. VDOT #21 OR #21A STONE USED WITH TYPE "E" PATCH, HYBRID PATCH, STREET WIDENING, OR STREET REBUILDING WILL NOT BE PAID FOR WITH THIS BID ITEM.

(21) PRICE PER TON FOR COARSE GRANULAR FILL SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO FURNISH AND INSTALL VDOT #57 STONE IN THE LOCATIONS DESIGNATED BY THE ENGINEER.

(22) PRICE PER SQUARE YARD FOR SEEDING AND FINE GRADING SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO RESTORE ALL GRASSED AND WOODED AREAS AS DETAILED IN THE CONSTRUCTION SPECIFICATIONS TO THE SATISFACTION OF THE INDIVIDUAL PROPERTY OWNERS AND THE CITY. THIS SHALL INCLUDE DRESSING AND GRADING SOILS TO TIE INTO NEW AND EXISTING IMPROVEMENTS WITHIN 0.05 OF A FOOT.

(23) PRICE PER SQUARE YARD FOR TEMPORARY SEEDING AND GRADING SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO ESTABLISH AND MAINTAIN TEMPORARY VEGETATIVE COVER FOR EROSION CONTROL PURPOSES.

(24) PRICE PER LINEAR FOOT FOR SILT FENCE BARRIER FOR EROSION CONTROL SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO INSTALL, MAINTAIN, AND REMOVE THE SILT FENCE AT THE LOCATIONS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND WHERE DIRECTED BY THE ENGINEER. PRICE SHALL INCLUDE INSTALLATION OF SILT FENCE TO A MAXIMUM HEIGHT OF 34" ABOVE GRADE AS DIRECTED BY THE ENGINEER.

(25) PRICE FOR EACH DROP INLET SILT TRAP SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO INSTALL, MAINTAIN, AND REMOVE THE DROP INLET SILT TRAPS AT THE LOCATIONS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND WHERE DIRECTED BY THE ENGINEER.

(26-27) PRICE PER TON FOR EACH SIZE UNGROUTED CLASS A1 OR CLASS I DRY RIPRAP SHALL INCLUDE ALL MATERIALS (INCLUDING GEOTEXTILE FABRIC), EQUIPMENT, AND LABOR REQUIRED TO INSTALL THE RIPRAP AT THE LOCATIONS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND WHERE DIRECTED BY THE ENGINEER, INCLUDING ALL EXCAVATION, BACKFILL AND SEEDING. RIPRAP APRONS AND CHANNEL LINING SHALL BE INSTALLED TO MATCH INVERT OF EXISTING CHANNEL SO AS TO NOT BLOCK FLOW.

(28) PRICE PER TON FOR CLASS I DRY RIPRAP WITH THE TOP LAYER BEDDED IN WITH 6 INCHES OF CONCRETE GROUT SHALL INCLUDE ALL MATERIALS (INCLUDING GEOTEXTILE FABRIC), EQUIPMENT, AND LABOR REQUIRED TO INSTALL THE GROUTED RIPRAP AT THE

LOCATIONS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND WHERE DIRECTED BY THE ENGINEER, INCLUDING ALL EXCAVATION, BACKFILL AND SEEDING. RIPRAP APRONS AND CHANNEL LINING SHALL BE INSTALLED TO MATCH INVERT OF EXISTING CHANNEL SO AS TO NOT BLOCK FLOW.

(29) PRICE PER TON FOR UNGROUTED CLASS II DRY RIPRAP SHALL INCLUDE ALL MATERIALS (INCLUDING GEOTEXTILE FABRIC), EQUIPMENT, AND LABOR REQUIRED TO INSTALL THE RIPRAP AT THE LOCATIONS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND WHERE DIRECTED BY THE ENGINEER, INCLUDING ALL EXCAVATION, BACKFILL AND SEEDING. RIPRAP APRONS AND CHANNEL LINING SHALL BE INSTALLED TO MATCH INVERT OF EXISTING CHANNEL SO AS TO NOT BLOCK FLOW.

(30) PRICE PER TON FOR CLASS II DRY RIPRAP WITH THE TOP 6 INCHES GROUTED SHALL INCLUDE ALL MATERIALS (INCLUDING GEOTEXTILE FABRIC), EQUIPMENT, AND LABOR REQUIRED TO INSTALL THE GROUTED RIPRAP AT THE LOCATIONS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND WHERE DIRECTED BY THE ENGINEER, INCLUDING ALL EXCAVATION, BACKFILL AND SEEDING. RIPRAP APRONS AND CHANNEL LINING SHALL BE INSTALLED TO MATCH INVERT OF EXISTING CHANNEL SO AS TO NOT BLOCK FLOW.

(31) PRICE PER TON FOR VDOT #1 STONE FOR COARSE AGGREGATE SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO INSTALL THE COARSE AGGREGATE AT THE LOCATIONS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND WHERE DIRECTED BY THE ENGINEER.

(32) PRICE PER SQUARE YARD FOR VDOT EC-2 PROTECTIVE COVERING SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO INSTALL THE PROTECTIVE COVERING AT THE LOCATIONS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND WHERE DIRECTED BY THE ENGINEER.

(33-34) PRICE FOR EACH SIZE FERNCO COUPLING SHALL INCLUDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FURNISH AND INSTALL FERNCO COUPLING TO JOIN TWO PIPES. ALL FERNCO COUPLINGS SHALL BE PAID FOR SEPARATELY. PRICE SHALL INCLUDE ENCASEMENT OF THE FERNCO COUPLING WITH A 4" THICK CLASS A3 CONCRETE ANTI-SETTLEMENT COLLAR EXTENDING FOR 6" BEYOND EITHER SIDE OF THE FERNCO.

(35) PRICE PER SQUARE YARD FOR ASPHALT PATCH, COLLECTOR TYPE B SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL A ROADWAY PATCH CONSISTING OF 4 INCHES OF COMPACTED VDOT #21A SUB-BASE STONE, A BASE COURSE OF 6 INCHES OF VDOT BM-25 INCLUDING SAW CUTTING PAVEMENT EDGES, AND 2 INCHES OF SM-12.5D PER STANDARD DETAILS.

(36) PRICE PER SQUARE YARD FOR ASPHALT PATCH, RESIDENTIAL TYPE C SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL A ROADWAY PATCH CONSISTING OF 4 INCHES OF COMPACTED VDOT #21A SUB-BASE STONE, A BASE COURSE OF 4 INCHES OF VDOT BM-25.0 INCLUDING SAW CUTTING PAVEMENT EDGES AND 2 INCHES OF SM-9.5D PER STANDARD DETAILS.

(37) PRICE PER SQUARE YARD FOR PERMANENT STONE PATCH, RESIDENTIAL HYBRID TYPE SHALL INCLUDE FURNISHING ALL

MATERIAL, EQUIPMENT, AND LABOR TO EXCAVATE AND INSTALL AASHTO TYPE III SUBGRADE SEPARATION AND STABILIZATION GEOTEXTILE, 12 INCHES OF VDOT #21/21A STONE COMPACTED IN TWO LIFTS, AND FULL SURFACE TREATMENT OF THE PATCHED AREA PER STANDARD DETAILS.

(38) PRICE PER SQUARE YARD FOR SURFACE TREATMENT SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL SURFACE TREATMENT, CONSISTING OF 75 POUNDS PER SQUARE YARD VDOT #21/21A STONE APPLIED IN THREE LAYERS. LAYERS SHALL BEGIN AND BE SEPARATED BY APPLICATION OF ASPHALT EMULSION APPLIED AT 0.3 GAL/SYD PER LAYER.

(39) PRICE PER SYD FOR APPLICATION OF A SINGLE LAYER OF LIQUID ASPHALT SEAL COAT (CRS-2) APPLIED TO TEMPORARY TRENCH PATCHES SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO INSTALL ONE LAYER OF SEAL COAT AT A RATE OF 0.15 GAL/SYD IN ACCORDANCE WITH VDOT STANDARD 312.

(40-41) PRICE PER SQUARE YARD FOR STREET WIDENING FOR APPROPRIATE TYPE STREET SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO WIDEN STREETS TO THE WIDTHS SHOWN ON THE PLANS USING STANDARD DETAILS INCLUDING SAW CUTTING EDGE OF EXISTING PAVEMENT. THE PRICE FOR NEW OR WIDENED DRIVEWAYS OR PARKING LOTS SHALL BE THE SAME AS FOR RESIDENTIAL STREET WIDENING. THE PRICE SHALL ALSO INCLUDE ALL EXCAVATION, AGGREGATE BASE, SEAL COAT, ASPHALT PAVEMENT, AND BACKFILL REQUIRED FOR STREET WIDENING.

(42) PRICE PER SQUARE YARD TO REBUILD COLLECTOR STREETS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO REBUILD STREETS TO THE WIDTHS SHOWN ON THE PLANS, WITH CITY STANDARD CROSS-SLOPE OF 0.25" PER FOOT OR AS DIRECTED BY THE ENGINEER. PRICE SHALL INCLUDE; ALL PAVEMENT AND SUBGRADE REMOVAL TO A DEPTH OF 10" BELOW EXISTING PAVEMENT SURFACE; SUBGRADE SHAPING AND COMPACTION AS REQUIRED FOR NEW PAVEMENT CROSS-SECTION; CLEANING AND PREPARATION OF PAVEMENT SURFACES, INCLUDING PRIME AND TACK COATING PRIOR TO ASPHALT PLACEMENT, SAW CUTTING EDGE OF EXISTING PAVEMENTS AND REMOVAL OF PAVEMENT FROM GUTTER PANS AS REQUIRED. THE PRICE SHALL INCLUDE PROVISION OF A MINIMUM SUB-BASE OF 2-INCHES OF COMPACTED VDOT #21A STONE, 6-INCHES OF BM-25.0 BASE COURSE AND A 2-INCH COMPACTED WEARING COURSE OF SM-12.5D PLACED AND COMPACTED PER SPECIFICATIONS.

(43) PRICE PER SQUARE YARD TO REBUILD RESIDENTIAL STREETS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO REBUILD STREETS TO THE WIDTHS SHOWN ON THE PLANS, WITH CITY STANDARD CROSS-SLOPE OF 0.25 INCH PER FOOT OR AS DIRECTED BY THE ENGINEER. PRICE SHALL INCLUDE; ALL PAVEMENT AND SUBGRADE REMOVAL TO A DEPTH OF 10 INCHES BELOW EXISTING PAVEMENT SURFACE; SUBGRADE SHAPING AND COMPACTION AS REQUIRED FOR NEW PAVEMENT CROSS-SECTION; CLEANING AND PREPARATION OF PAVEMENT SURFACES, INCLUDING PRIME AND TACK COATING PRIOR TO ASPHALT PLACEMENT, SAW CUTTING EDGE OF EXISTING PAVEMENTS AND REMOVAL OF PAVEMENT FROM GUTTER PANS AS REQUIRED. THE PRICE SHALL INCLUDE PROVISION OF A 4-INCH COMPACTED LIFT OF VDOT 21A BASE STONE, PRIME COAT, AND A BASE COURSE OF 4 INCHES OF VDOT BM-25.0 INCLUDING SAW

CUTTING PAVEMENT EDGES AND 2 INCHES OF SM-9.5D PER STANDARD DETAILS.

(44) PRICE PER LINEAR FOOT FOR ALL FORMS OF COMBINED CURB AND GUTTER SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL ALL STYLES OF CURB AND GUTTER PER CITY STANDARD DETAILS, INCLUDING REMOVAL AND DISPOSAL OF ANY EXISTING ROAD PAVEMENT AS REQUIRED. THE PRICE SHALL ALSO INCLUDE ALL EXCAVATION AND BACKFILL REQUIRED FOR THE INSTALLATION OF CURB AND GUTTER, REMOVAL OF EXISTING CURB AND GUTTER WILL BE PAID FOR SEPARATELY. GUTTER PAN IN FRONT OF NEW CURB INLETS WILL BE PAID FOR UNDER THIS ITEM.

(45) PRICE PER SQUARE YARD FOR NEW CONCRETE DRIVEWAYS AND ENTRANCES WHERE THERE ARE NO CONCRETE ENTRANCES CURRENTLY SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL THE DRIVEWAYS AND ENTRANCES SUCH THAT THEY MATCH ADJACENT PROPERTIES AND STANDARD DETAILS.

(46) PRICE PER SQUARE YARD FOR NEW CONCRETE SIDEWALKS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL NEW CONCRETE SIDEWALKS WHERE THERE IS NO EXISTING SIDEWALKS PER CITY STANDARD DETAIL. THE PRICE SHALL ALSO INCLUDE ALL EXCAVATION AND BACKFILL REQUIRED FOR THE INSTALLATION OF NEW CONCRETE SIDEWALKS.

(47) PRICE PER SQUARE YARD FOR CONCRETE HANDICAP RAMPS TO BE INSTALLED IN SIDEWALKS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL THE HANDICAP RAMPS AT THE POINTS DESIGNATED ON THE CONSTRUCTION DRAWINGS AND REMOVAL AND DISPOSAL OF REQUIRED CONCRETE TO FACILITATE INSTALLATION OF RAMPS WHERE REQUIRED, PER STANDARD DETAIL. THE PRICE SHALL ALSO INCLUDE ALL EXCAVATION AND BACKFILL REQUIRED FOR THE INSTALLATION OF CONCRETE HANDICAP RAMPS. CURB AND GUTTER INSTALLATION OR REPLACEMENT IN FRONT OF THIS ITEM SHALL BE PAID FOR SEPARATELY.

(48) PRICE PER LINEAR FOOT FOR 6-INCH BY 12-INCH CURB AND FACEDOWN CURB FOR SIDEWALKS PER CITY STANDARD DETAILS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO INSTALL CURB IN VARIOUS LOCATIONS AS SHOWN ON THE CONSTRUCTION DRAWINGS. THE PRICE SHALL ALSO INCLUDE ALL EXCAVATION AND BACKFILL REQUIRED FOR THE INSTALLATION OF 6-INCH BY 12-INCH FACEDOWN CURB. INSTALLATION OF THE SIDEWALK PORTION SHALL BE PAID FOR AS SIDEWALK AS SQUARE YARDS, CURB REMOVAL SHALL BE PAID FOR SEPARATELY UNDER CURB AND GUTTER REMOVAL BID ITEM.

(49) PRICE FOR EACH EXISTING MANHOLE THAT MUST BE ADJUSTED FOR PROFILING AND RESURFACING OF STREET SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR, INCLUDING IRON ADJUSTING RING AS REQUIRED TO ADJUST EACH EXISTING MANHOLE FRAME AND COVER TO MATCH THE FINISHED SURFACE ELEVATION OF THE STREET IN WHICH IT IS LOCATED. HEIGHT ADJUSTMENT WITH CONCRETE WILL BE PAID FOR SEPARATELY AS REQUIRED. ALL MANHOLES SHALL BE ADJUSTED TO PRECISELY MATCH FINAL PAVEMENT SURFACE.

(50) PRICE FOR EACH EXISTING VALVE BOX CASTING THAT MUST BE ADJUSTED FOR PROFILING AND RESURFACING OF STREET SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO ADJUST EACH VALVE BOX CASTING TO MATCH THE FINISHED SURFACE ELEVATION OF THE STREET IN WHICH IT IS LOCATED, INCLUDING PROVISION OF IRON ADJUSTING RINGS AS REQUIRED.

(51) PRICE PER VERTICAL INCH FOR ADJUSTMENT OF MANHOLE COVER FRAMES USING PRECAST CONCRETE RINGS OR MANHOLE ADJUSTMENT WITH APPROVED CAST IN PLACE METHODS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO ADJUST MANHOLE COVER FRAMES TO PRECISELY MATCH SURROUNDING PAVEMENT IN ACCORDANCE WITH SPECIFICATIONS. ALL FRAMES, CONCRETE AND JOINTS SHALL BE SEALED TO EXHIBIT ZERO INFILTRATION OR LEAKAGE.

(52) PRICE PER SQUARE YARD FOR PAVEMENT PROFILING 1-INCH THICKNESS SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO REMOVE AND PROPERLY DISPOSE OF EXISTING ASPHALT OR CONCRETE SURFACES ON IN-PLACE PAVEMENTS TO PRODUCE THE DESIRED PROFILE, CROSS-SECTION, AND SURFACE CONDITIONS. FOR DEPTHS GREATER THAN 1 INCH, THE ACTUAL DEPTH PROFILED, IN 1/2-INCH INCREMENTS SHALL BE MULTIPLIED BY THE UNIT COST FOR 1-INCH PROFILE TO DETERMINE PAYMENT.

(53) PRICE PER TON OF SM-9.5A, SM-12.5D, OR BM 25.0 FOR PAVEMENT OVERLAY SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO RESURFACE STREETS AS SHOWN ON THE PROJECT PLANS, PER STANDARD DETAILS OR AS DIRECTED BY THE ENGINEER.

(54) PRICE PER SQUARE YARD OF PAVEMENT REMOVAL SHALL INCLUDE FURNISHING ALL MATERIAL, EQUIPMENT, AND LABOR TO REMOVE AND PROPERLY DISPOSE OF EXISTING PAVEMENT, BASE MATERIAL, AND SUBBASE MATERIAL TO THE DEPTH REQUIRED FOR THE NEW PAVEMENT SECTION. THIS PAY ITEM DOES NOT INCLUDE PAVEMENT REMOVAL, WHICH IS INCLUDED IN OTHER BID ITEMS.

(55) PRICE PER SQUARE YARD OF ADDITIONAL BM-25.0 ASPHALT FOR 1-INCH DEPTH THAT IS TO BE PUT ON TOP OF NORMAL TRENCH PATCH AS A TEMPORARY MEASURE UNTIL STREET PROFILING AND OVERLAY CAN BE DONE. FOR DEPTHS GREATER THAN 1 INCH, THE ACTUAL ADDITIONAL DEPTH SHALL BE MULTIPLIED BY THE UNIT COST FOR 1-INCH ADDITIONAL DEPTH OF ASPHALT TO DETERMINE PAYMENT.

(56) PRICE PER SQUARE YARD FOR ASPHALT DRIVEWAY REMOVAL SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO REMOVE AND PROPERLY DISPOSE OF EXISTING ASPHALTIC DRIVEWAYS AND TO PREPARE THE AREA EXPOSED FOR SEEDING AND FINE GRADING.

(57) PRICE PER SQUARE YARD FOR CONCRETE DRIVEWAY REMOVAL SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO REMOVE AND PROPERLY DISPOSE OF EXISTING CONCRETE DRIVEWAYS AND TO PREPARE THE AREA EXPOSED FOR SEEDING AND FINE GRADING.

(58) PRICE PER LINEAR FOOT FOR CHAIN LINK FENCE RELOCATION SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO MOVE EXISTING CHAIN LINK FENCES FROM THEIR PRESENT LOCATION

TO A LOCATION DESIGNATED ON THE PLANS OR AS DESIGNATED BY THE ENGINEER.

(59) PRICE PER LINEAR FOOT FOR WOVEN WIRE FENCE RELOCATION SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO MOVE EXISTING WOVEN WIRE FENCES FROM THEIR PRESENT LOCATION TO A LOCATION DESIGNATED ON THE PLANS OR AS DESIGNATED BY THE ENGINEER.

(60) PRICE PER LINEAR FOOT FOR TREATED WOOD FENCE RELOCATION SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO MOVE EXISTING TREATED WOOD FENCES FROM THEIR PRESENT LOCATION TO A LOCATION DESIGNATED ON THE PLANS OR AS DESIGNATED BY THE ENGINEER.

(61) PRICE PER SQUARE YARD FOR LANDSCAPING RELOCATION SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO MOVE EXISTING LANDSCAPED AREAS FROM THEIR PRESENT LOCATION TO LOCATIONS DESIGNATED BY THE AFFECTED PROPERTY OWNER (S). LANDSCAPING SHALL INCLUDE SUCH ITEMS AS ORNAMENTAL PLANTS, MULCH, LANDSCAPING BORDERS, ORNAMENTAL CONCRETE OR PORCELAIN ITEMS, ETC.

(62) PRICE PER LINEAR FOOT FOR REMOVAL OF ROCK OR CONCRETE RETAINING WALLS SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO REMOVE AND PROPERLY DISPOSE OF ROCK OR CONCRETE RETAINING WALLS UP TO 4 FEET IN HEIGHT.

(63) PRICE PER LINEAR FOOT FOR TO REMOVE AND REBUILD ROCK OR CONCRETE RETAINING WALLS SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR TO REMOVE EXISTING WALL AND REBUILD ROCK OR CONCRETE RETAINING WALLS UP TO 4 FEET IN HEIGHT.

(64) UNIT PRICE PER TON OF PAVING FOR REINSTATEMENT OF EXISTING DRIVEWAYS DISTURBED DURING CONSTRUCTION, AS DIRECTED BY THE ENGINEER OR AS CALLED FOR ON PROJECT PLANS. THIS ITEM WILL ONLY BE USED WHEN DRIVEWAY PAVING IS NOT COINCIDENTAL WITH ADJACENT STREET PAVING, CONJUNCTIVE DRIVEWAY PAVING WILL BE PAID FOR UNDER THE UNIT PRICE FOR STREET OVERLAY.

(65) PRICE PER LINEAR FOOT TO INSTALL VDOT STANDARD BLOCKED-OUT W-BEAM GUARD RAIL, INCLUDING ALL MATERIALS, EQUIPMENT, AND LABOR TO INSTALL STRONG POST SYSTEM, (VDOT GR-2), AS CALLED FOR ON PROJECT PLANS INCLUDING REMOVAL AND REUSE OF ANY SALVAGEABLE GUARDRAIL AS REQUIRED. THIS SHALL INCLUDE PROVISION OF GALVANIZED METAL POSTS, ALL CONNECTIONS, MOUNTING BLOCKS, STANDARD W-BEAM ROUNDED END PIECES, ASSOCIATED HARDWARE, AND MATERIALS IN ACCORDANCE WITH VDOT STANDARDS.

(66) PRICE PER LINEAR FOOT TO INSTALL VDOT STANDARD TUBULAR HANDRAIL, HR-1, INCLUDING ALL MATERIALS, EQUIPMENT, AND LABOR TO INSTALL HANDRAIL AS CALLED FOR ON PROJECT PLANS, INCLUDING REMOVAL OF EXISTING HANDRAILS AND REUSE AS SALVAGEABLE. THIS SHALL INCLUDE ANCHORING POSTS IN CONCRETE, ALL MOUNTING BRACKETS, END PIECES, AND SLOPE TRANSITIONS AS REQUIRED IN ACCORDANCE WITH VDOT STANDARDS.

(67) PRICE TO REMOVE AND RE-PLANT OR REPLACE WITH NEW PLANTINGS OF EQUAL QUALITY AS AGREED BY THE PROPERTY OWNER, EACH INDIVIDUAL BUSH, SHRUB OR TREE WITHIN THE LIMITS OF CONSTRUCTION, OR AS CALLED FOR RELOCATION ON THE CONSTRUCTION PLANS. WHEN RELOCATING LARGER CONTIGUOUS AREAS SUCH AS BEDS AND HEDGES, PAYMENT WILL BE BASED ON SQUARE YARDS IN ACCORDANCE WITH APPROPRIATE BID ITEM ABOVE. TREES PROVIDED UNDER THIS ITEM SHALL BE A MINIMUM OF 4 FEET TALL.

(68) LUMP SUM PRICE FOR TRAFFIC CONTROL FOR ALL STREETS SHALL INCLUDE FURNISHING ALL MATERIALS, EQUIPMENT, AND LABOR NECESSARY FOR THE MAINTENANCE AND PROTECTION OF PEDESTRIAN AND VEHICULAR TRAFFIC AROUND THE AREA OF CONSTRUCTION IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS

(69) PRICE TO CONDUCT FINAL AS-BUILT SURVEY, DEVELOP AND SUBMIT ELECTRONIC DATA FILE OF SURVEY INFORMATION, AND SUBMIT REDLINE CONSTRUCTION DRAWINGS TO ENABLE RECORD DRAWINGS TO BE PREPARED BY THE CITY ENGINEER. THIS ITEM SHOULD NO LONGER BE INCLUDED IN LUMP SUM PRICE FOR GENERAL CONDITION REQUIREMENTS.

(70) UNIT PRICE FOR COMPACTION TEST TO CONFIRM DENSITY OF BACKFILL, SUBGRADE, OR NATIVE MATERIAL AS DIRECTED BY THE ENGINEER. TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH AASHTO T272 AND T99 AS MODIFIED TO INCLUDE MOISTURE CONTENT AND MATERIAL SIZES USED IN LABORATORY DETERMINATION OF DENSITY. NUCLEAR GAUGE DENSITY ANALYSIS SHALL BE RELATED TO THE DENSITY OF THE SAME MATERIAL TESTED IN ACCORDANCE WITH VTM-1, VTM-10, OR VTM-12. A CONTROL STRIP WILL NOT BE REQUIRED. THIS ITEM SHALL NOT BE USED TO PAY FOR RETESTING AN AREA WHICH FAILS INITIAL TESTING - RETESTING AREAS THAT FAIL INITIAL TEST SHALL BE AT CONTRACTOR EXPENSE.

(GCI) LUMP SUM PRICE FOR GENERAL CONDITION REQUIREMENTS SHALL INCLUDE BONDS, INSURANCE, PERMITS, LICENSES, FEES, PROJECT SIGNS, FIELD OFFICE, MOBILIZATION, AND DEMOLITION. THE MAXIMUM LUMP SUM PRICE FOR THIS ITEM SHALL BE 5 PERCENT OF THE TOTAL BID PRICE, AND 50 PERCENT OF THIS ITEM WILL BE PAID WITH THE FIRST PAY REQUEST AND THE REMAINDER DIVIDED EQUALLY OVER THE REMAINING MONTHS OF THE PROJECT.

NOTE: THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL EROSION CONTROL MEASURES THROUGHOUT THE PROJECT UNTIL WARRANTY PERIOD IS FULFILLED. THE COST FOR MAINTENANCE OF THESE MEASURES SHALL BE CONSIDERED TO BE INCLUDED IN ALL UNIT PRICE BID ITEMS AND WILL NOT BE PAID FOR SEPARATELY.

1.04 COORDINATION

A. PHASES OF THE CONSTRUCTION WHICH INVOLVE THE TEMPORARY INTERRUPTION OF ESSENTIAL SERVICES SHALL BE SCHEDULED IN CONSULTATION WITH THE OWNER OR HIS REPRESENTATIVE AT LEAST 5 WORKING DAYS IN ADVANCE AND SHALL NOT BE OF LONGER DURATION THAN ESSENTIAL TO ACCOMPLISH THE PURPOSE FOR SUCH INTERRUPTIONS. LIAISON WITH OWNER IN THIS MATTER SHALL BE A SALIENT FEATURE OF THIS CONTRACT.

B. ANY WATER OR SEWER SERVICE CONNECTION WORK THAT IS PERFORMED BY THE CONTRACTOR MUST BE DONE BY A CERTIFIED PLUMBER.

C. THE CONTRACTOR SHALL NOTIFY RESIDENTS IN WRITING A MINIMUM OF TWO DAYS PRIOR TO INITIATING WORK ON ANY PRIVATE PROPERTY, OR WHEN CONSTRUCTION OPERATIONS WILL IMPINGE ON PRIVATE PROPERTY (SUCH AS BUT NOT LIMITED TO WORK IN ALLEYS, RIGHT-OF-WAYS, AND EASEMENTS). NOTICES SHALL DETAIL WHAT WORK IS SCHEDULED AND WHAT IMPACTS ARE EXPECTED.

1.05 FIELD ENGINEERING: WILEY & WILSON SHALL PROVIDE REFERENCE POINTS ON THE DRAWINGS FROM WHICH THE CONTRACTOR SHALL LAY OUT THE WORK. THE CONTRACTOR SHALL STAKE OUT THE ALIGNMENT OF THE ACTUAL CENTERLINE USING OFFSET STAKES. THE CONTRACTOR SHALL PROTECT AND PRESERVE ALL REFERENCE POINTS AND OFFSET STAKES AND REPLACE IT AT NO ADDITIONAL COST IF THEY ARE DESTROYED. THE CONTRACTOR SHALL PROVIDE A QUALIFIED SURVEYOR TO LAY OUT ALL STREET WIDENING, CURB AND GUTTER, DRIVEWAY ENTRANCES, HANDICAP RAMPS, AND THE LIKE AS GENERALLY SHOWN ON THE DRAWINGS AND AS SPECIFICALLY DIRECTED BY THE OWNER OR HIS REPRESENTATIVE. ALL STAKEOUT WORK SHALL BE DONE BY A SURVEYOR LICENSED TO DO BUSINESS IN THE STATE OF VIRGINIA. THE COST OF THE SURVEYOR SHALL BE DISTRIBUTED AMONG THE VARIOUS BID ITEMS AND WILL NOT BE PAID FOR SEPARATELY.

1.06 PROJECT MEETINGS

A. PRECONSTRUCTION CONFERENCES WITH THE CONTRACTOR WILL BE HELD WITHIN 20 DAYS AFTER THE EFFECTIVE DATE OF THE AGREEMENT.

B. PROGRESS MEETINGS: EACH MONTH THE CONTRACTOR SHALL HOLD A PROGRESS MEETING TO REVIEW PROGRESS TO DATE AND TO RESOLVE ALL QUESTIONS FOR THE UPCOMING MONTH. NOTIFY THE OWNER AT LEAST 1 WEEK IN ADVANCE OF THE MEETING TO ENSURE SUITABLE DATE AND TIME. INCLUDE MEETING AGENDA WITH NOTIFICATION. CONTRACTOR SHALL PROVIDE UP TO DATE RECORD DRAWINGS AND EROSION CONTROL PLANS FOR REVIEW AND APPROVAL AT EACH PROGRESS MEETING. THE PROJECT SCHEDULE SHALL BE UPDATED AND ANY OUT OF HOURS WORK SCHEDULED FOR THE NEXT MONTH SHALL BE CONFIRMED BY A WRITTEN SCHEDULE PRESENTED AT THE PROGRESS MEETING.

C. THE CONTRACTOR SHALL ATTEND A NEIGHBORHOOD MEETING TO DISCUSS HIS CONSTRUCTION SCHEDULE AND ANSWER CITIZEN QUESTIONS. THE CITY WILL SCHEDULE THE MEETING WITHIN 2 WEEKS OF THE NOTICE TO PROCEED, AND THE CONTRACTOR WILL BE NOTIFIED OF THE TIME AND LOCATION OF THE NEIGHBORHOOD MEETING.

1.07 SUBMITTALS

A. PROGRESS SCHEDULE: SUBMIT A DETAILED CONSTRUCTION SCHEDULE WITHIN 14 DAYS OF AWARD OR INTENT TO AWARD. THIS SCHEDULE SHALL BE USED FOR THE DURATION OF THE PROJECT AND CURRENT STATUS SHALL BE UPDATED AND PRESENTED AT EACH PROGRESS MEETING. THIS SCHEDULE SHALL BE DEVELOPED USING MICROSOFT PROJECT STANDARD 2003, AND SHALL INCLUDE CRITICAL PATH TASK IDENTIFICATION, SEQUENCING, AND INCLUDE LINKS TO NON-CRITICAL TASKS WHICH MAY IMPACT CRITICAL ITEMS. THE PROJECT TASK ITEMS SHALL BE DEVELOPED IN SUFFICIENT DETAIL TO ADDRESS PROJECT COMPLEXITY AND SHALL INCLUDE AS A MINIMUM A BLOCK BY BLOCK TASK LIST FOR SANITARY, STORM, LINING AND REHABILITATION, WATER MAIN, SERVICE CONNECTIONS, CONCRETE IMPROVEMENTS, TEMPORARY AND PERMANENT STREET PATCHING, AND RESTORATION ACTIVITIES FOR WORK IN DEVELOPED AREAS AND STREETS. THIS SHALL INCLUDE A TASK ITEM DETAILING DURATION OF STREET AND INTERSECTION DISTURBANCE AND ANY CLOSURES REQUIRED FOR WORK. OFF ROAD WORK TASK LISTS MAY BE BROKEN

DOWN ON A LINE SEGMENT BASIS. THE SCHEDULE SHALL REFLECT THE MANPOWER, EQUIPMENT, AND MATERIAL RESOURCES REQUIRED FOR EACH TASK, THE TASK START DATE, TASK DURATION, TASK COMPLETION DATE, AND ALLOWABLE FLOAT OF EACH CRITICAL TASK IN CALENDAR DAYS AND INCLUDE LINKS BETWEEN CRITICAL TASKS TO ADEQUATELY DEFINE AFFECTS OF ANY DELAYS IN CRITICAL WORK. THE CONTRACTOR SHALL MAINTAIN THIS SCHEDULE UP TO DATE AND SHALL PRESENT IT AT EACH MONTHLY PROGRESS MEETING SHOWING ACTUAL VERSUS PROGRAMMED SCHEDULE, TASK COMPLETION STATUS, AND OVERALL CONTRACT COMPLETION PROGRESS. THIS SHALL BE PRESENTED IN A TIMELINE GRAPHIC FORMAT, WITH COLUMNS SHOWING PERCENT COMPLETE AND RELEVANT TASK DATES. THIS UPDATED SCHEDULE SHALL BE PROVIDED AT EACH MONTHLY MEETING ON TWO COLOR PAPER COPIES AND A DIGITAL FILE IN MICROSOFT PROJECT STANDARD 2003 FORMAT ON 3.5 INCH DISK. THE SCHEDULE SHALL BE DEVELOPED BASED ON NORMAL FIVE DAY WORK WEEK, ROUTINE DAYTIME OPERATIONS, AND INCLUDE PROVISIONS FOR EXPECTED WEATHER DAYS AS OUTLINED IN THIS PROJECT MANUAL. ADDITIONAL WORK ORDERED BY THE OWNER SHALL BE INSERTED AND TRACKED IN THE PROJECT SCHEDULE AS APPROPRIATE.

B. DISBURSEMENT OF FUNDS SCHEDULE: AT THE PRECONSTRUCTION CONFERENCE, SUBMIT A DISBURSEMENT OF FUNDS SCHEDULE DETAILING THE CONTRACTOR'S ANTICIPATED MONTHLY PAY REQUEST AMOUNTS FOR THE ENTIRE PROJECT TIME. REVISE THE SCHEDULE BEFORE EACH PROGRESS MEETING.

C. AT THE PRECONSTRUCTION MEETING, SUBMIT THE FOLLOWING: A DETAILED WRITTEN CONSTRUCTION OPERATIONS PLAN PROVIDING A DESCRIPTION OF HOW BYPASS PUMPING AND CREEK BYPASS OPERATIONS SHALL BE CONDUCTED; A PLAN FOR BLASTING OPERATIONS; A PLAN FOR TEMPORARY STREAM CROSSINGS FOR ACCESS TO CONSTRUCTION AREAS; A DETAILED EROSION AND SEDIMENTATION CONTROL PLAN AND DRAWINGS FOR THE PROJECT; THE EROSION CONTROL PLAN SHALL CONSIST OF A MINIMUM OF FULL SIZE 1:100 SCALE PLAN SHEETS SHOWING EXISTING AND PROPOSED CONTOURS, ALL PROPOSED STREET, UTILITY AND GRADING WORK, DIMENSIONS AND DESCRIPTIONS OF ALL INLET AND OUTLET PROTECTION AND STREAM BANK STABILIZATION MEASURES, Q10 FLOW RATES AND DRAINAGE AREA DELINEATIONS FOR ALL DRAINAGE OUTLET POINTS, A NARRATIVE DESCRIPTION OF EROSION AND SEDIMENT CONTROL MEASURES, A DETAILED DESCRIPTION OF CONSTRUCTION SEQUENCING, TEMPORARY AND PERMANENT SEEDING PRACTICES, AND INSPECTION AND MAINTENANCE GUIDANCE, AND CRITERIA FOR REMOVAL OF TEMPORARY CONTROL MEASURES. A COMPLETED REGISTRATION STATEMENT AND DETAILED STORMWATER POLLUTION PREVENTION PLAN; PREPARED IN ACCORDANCE WITH VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM GENERAL PERMIT FOR CONTROL OF STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES. A DETAILED TRAFFIC CONTROL PLAN SHOWING HOW TRAFFIC WILL BE MANAGED IN ALL STREETS AFFECTED BY THE PROJECT WORK. THIS TRAFFIC CONTROL PLAN SHALL SPECIFICALLY DESCRIBE EACH TRAFFIC CONTROL MEASURE TO BE USED AND PROVIDE A LOCATION PLAN OR MAP SHOWING DETOUR ROUTING, CONTROL DEVICE TYPES AND LOCATIONS, SIGN LOCATIONS, FLAGGING, TEMPORARY PAVEMENT MARKING, AND OTHER OPERATIONAL CONTROLS. THIS TRAFFIC CONTROL PLAN SHALL PROVIDE MEASURES FOR EMERGENCY VEHICLE ACCESS TO EACH STREET AND DESCRIBE MEASURES TO ENSURE PROPERTY OWNER AND BUSINESS ACCESS ON EACH STREET.

D. SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES: WITHIN 10 DAYS OF NOTICE TO PROCEED SUBMIT A SUBMITTAL SCHEDULE FIXING THE DATES FOR SUBMISSION OF SHOP DRAWINGS, PROJECT DATA, SAMPLES, AND THE LIKE. UPDATE THIS SCHEDULE AT EACH PROGRESS MEETING TO REFLECT THE STATUS OF EACH SUBMITTAL ITEM. NOTE THAT TRADE NAMES, BRAND NAMES AND/OR MANUFACTURER'S INFORMATION USED IN THESE SPECIFICATIONS ARE FOR THE

PURPOSE OF ESTABLISHING QUALITY. BIDS BASED ON PRODUCTS OF OTHER QUALIFIED MANUFACTURERS ARE ACCEPTABLE PROVIDED REQUESTS ARE MADE IN WRITING NOT LESS THAN TEN (10) DAYS PRIOR TO SCHEDULED RECEIPT OF BIDS, AND PROPOSED SUBSTITUTES WILL REQUIRE NO MAJOR CHANGES IN CONSTRUCTION, DESIGN, OR MODIFICATIONS TO PROPOSED OR EXISTING SERVICES OR EQUIPMENT. ANY ADDITIONAL COSTS INCLUDING THE ENGINEERS ANALYSIS TIME ASSOCIATED WITH THIS SUBSTITUTION SHALL BE THE CONTRACTOR'S RESPONSIBILITY.

(1) SUBMIT FOUR COPIES OF ALL SHOP DRAWINGS AND TECHNICAL DATA.

(2) A MAXIMUM OF TWO MARKED COPIES WILL BE RETURNED TO THE CONTRACTOR, OR ONE ADDITIONAL REPRODUCIBLE COPY MAY BE SUBMITTED TO BE MARKED AND RETURNED FOR CONTRACTOR'S USE.

(3) SUBMIT SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND THE LIKE AS REQUIRED BY APPLICABLE SPECIFICATION SECTIONS.

(4) IDENTIFY EACH ITEM SUBMITTED USING APPLICABLE SPECIFICATION SECTION NUMBER AND PARAGRAPH REFERENCE, DRAWING, OR STANDARD DETAIL REFERENCE.

(5) ALL SHOP DRAWINGS SHALL BE APPROVED BY THE CONTRACTOR AND ANY SUBCONTRACTORS PRIOR TO SUBMITTAL. CERTIFYING THAT THE MATERIALS OR ITEM IS PROVIDED IN ACCORDANCE WITH CONTRACT DOCUMENTS.

(6) FAILURE TO COMPLY WITH THESE REQUIREMENTS WILL RESULT IN THE SUBMITTAL BEING RETURNED UNPROCESSED.

E. SCHEDULE OF VALUES: SUBMIT DETAILED SCHEDULE OF VALUES AT LEAST 10 DAYS PRIOR TO FIRST APPLICATION FOR PAYMENT. THE OWNER OR HIS REPRESENTATIVE MUST APPROVE THE SCHEDULE OF VALUES. THE SCHEDULE OF VALUES SHALL IDENTIFY THE VARIOUS ITEMS THAT WILL NOT BE REIMBURSED THROUGH VRLF AS DEFINED BY THE OWNER. THE BID SCHEDULE SHOULD BE USED AS THE BASIS TO ESTABLISH THE SCHEDULE OF VALUES.

F. MATERIAL SCHEDULE: WITHIN 14 DAYS AFTER EFFECTIVE DATE OF THE AGREEMENT, SUBMIT FOR APPROVAL A SCHEDULE LISTING MANUFACTURER OF THE ITEMS OF EQUIPMENT AND MATERIALS PROPOSED FOR THE CONSTRUCTION. FOLLOWING APPROVAL OF THE SCHEDULE, NO CHANGES IN MATERIAL OR EQUIPMENT FROM THOSE LISTED WILL BE ALLOWED EXCEPT IN UNUSUAL OR EXTENUATING CIRCUMSTANCES. WHEN SUCH CIRCUMSTANCES ARISE, THE CONTRACTOR SHALL REQUEST, IN WRITING, APPROVAL OF THE PROPOSED CHANGE STATING THE CIRCUMSTANCES NECESSITATING SUCH A CHANGE. THE INTENT OF THIS SCHEDULE IS TO NAME THE MANUFACTURERS OF MATERIAL SPECIFIED BY A PRODUCT STANDARD AND TO DESIGNATE WHICH MANUFACTURER WILL BE USED WHEN MORE THAN ONE HAS BEEN NAMED FOR AN ITEM IN THE SPECIFICATIONS. THE SCHEDULE SHALL NOT BE INTERPRETED AS ALLOWING ANY CHANGE FROM BASE BID ITEMS OR THOSE SUBSTITUTE ITEMS OFFERED WITH THE BID AND ACCEPTED IN THE AGREEMENT.

G. CONSTRUCTION PHOTOGRAPHS: THE CONTRACTOR SHALL PHOTOGRAPH OR VIDEO TAPE PROJECT AREAS AND SUBMIT THEM TO THE ENGINEER PRIOR TO BEGINNING CONSTRUCTION. AT THE END OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE ANOTHER SET OF PHOTOGRAPHS OR VIDEO TAPE DOCUMENTING FINAL RESTORATION.

H. CONTRACTOR SHALL UPDATE RECORD DRAWINGS AND PRESENT THEM AT EACH MONTHLY PROGRESS MEETING FOR REVIEW AND APPROVAL.

1.08 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

A. TEMPORARY UTILITIES

(1) TEMPORARY SANITARY FACILITIES: CONTRACTOR SHALL PROVIDE AND MAINTAIN IN A NEAT AND SANITARY CONDITION SUCH ACCOMMODATIONS FOR THE USE OF HIS EMPLOYEES AS WILL COMPLY WITH LAWS AND REGULATIONS.

B. POLLUTION CONTROL

(1) DUST CONTROL: THE CONTRACTOR SHALL BE REQUIRED TO SPRINKLE WITH WATER OR TO APPLY DUST ALLAYING MATERIALS IN THE VICINITY OF DWELLINGS, SCHOOLS, CHURCHES, STORES, OR OTHER PLACES, WHERE IN THE OPINION OF THE ENGINEER, THIS IS NECESSARY TO ENSURE THAT DUST IS HELD TO AN ABSOLUTE MINIMUM. DUST CONTROL IS CONSIDERED INCIDENTAL AND SHALL BE CARRIED OUT AT THE CONTRACTOR'S EXPENSE. DRY POWER BROOMING WILL NOT BE PERMITTED. THE CONTRACTOR SHALL WASH STREETS AFFECTED BY CONSTRUCTION ON A DAILY BASIS TO CONTROL DUST.

(2) THE CONTRACTOR IS RESPONSIBLE FOR MANAGING CONSTRUCTION PRACTICES IN ACCORDANCE WITH THE APPROVED EROSION CONTROL AND STORMWATER POLLUTION PREVENTION PLANS, AND SHALL INSTALL AND MAINTAIN ALL MEASURES NECESSARY TO MAINTAIN COMPLIANCE WITH APPLICABLE STORMWATER MANAGEMENT AND EROSION CONTROL REGULATIONS.

C. PROJECT IDENTIFICATION: ONE CLEAR AND LEGIBLE PROJECT SIGN SHALL BE PROVIDED ON THE PROJECT BY THE CONTRACTOR AS SOON AS HE COMMENCES WORK AND MOBILIZES HIS FORCES. THE LOCATION OF THE SIGN SHALL BE AS DETERMINED BY THE OWNER. THE SIGN SHALL CONTAIN THE FOLLOWING INFORMATION AND MEET THE FOLLOWING REQUIREMENTS:

(1) DIMENSIONS SHALL NOT BE LESS THAN 4 FEET BY 8 FEET.

(2) LETTERING SHALL NOT BE LESS THAN AS SHOWN ON STANDARD DETAIL.

(3) IT SHALL LIST CONTRACTOR'S NAME, CONTRACTOR'S FOREMAN NAME, AND LOCAL PHONE NUMBER.

(4) IT SHALL LIST THE NAME OF THE PROJECT AND CITY PROJECT NUMBER.

(5) THE CITY OF LYNCHBURG LOGO.

(6) THE AMOUNT OF THE PROJECT.

(7) IT SHALL LIST ENGINEER'S NAME, ENGINEER'S INSPECTOR, AND CSO CITIZEN INFORMATION LINE (804) 847-7246.

(8) IT SHALL INDICATE FUNDING BY EPA AND COMMONWEALTH OF VIRGINIA GRANT.

(9) THE SIGN SHALL BE CONSTRUCTED OF A STURDY AND DURABLE MATERIAL.

(10) SIGN OR SIGNS SHALL BE PLACED IN SUCH A MANNER AS TO BE CLEARLY RECOGNIZABLE BY THE PUBLIC.

FURTHER DETAILS OF THE PROJECT SIGN'S REQUIREMENTS ARE SHOWN ON THE STANDARD DETAIL PROVIDED IN THIS PROJECT MANUAL. PROJECT SIGN SHALL BE APPROVED BY THE OWNER.

THE CONTRACTOR SHALL MAINTAIN THIS SIGN FOR THE DURATION OF THE CONTRACT AND DISPOSE OF IT AFTER COMPLETION. IF THIS SIGN BECOMES DETERIORATED AND THE ENGINEER DECIDES A NEW SIGN IS NEEDED, THE CONTRACTOR SHALL FURNISH IT ALSO. THERE SHALL BE NO SEPARATE PAYMENT FOR THIS ITEM.

D. TRAFFIC CONTROL

(1) THIS WORK SHALL CONSIST OF MAINTENANCE AND PROTECTION OF PEDESTRIAN AND VEHICULAR TRAFFIC AROUND ALL AREAS OF CONSTRUCTION. THE CONTRACTOR SHALL SUBMIT A DETAILED TRAFFIC CONTROL PLAN TO THE CITY TRAFFIC ENGINEER AT THE PRECONSTRUCTION CONFERENCE FOR APPROVAL. THIS PLAN SHALL SPECIFICALLY ADDRESS TRAFFIC CONTROL FOR ALL STREETS AFFECTED BY THE PROJECT AND MUST BE APPROVED BY THE CITY TRAFFIC ENGINEER PRIOR TO STARTING CONSTRUCTION. ALL TRAFFIC CONTROL DEVICES INDICATED ON THE LAYOUTS OR DEEMED NECESSARY BY THE CITY TRAFFIC ENGINEER IS TO BE FURNISHED BY THE CONTRACTOR. ALL TRAFFIC CONTROL DEVICES PROVIDED BY THE CONTRACTOR SHALL CONFORM TO THE LATEST MUTCD AND VDOT REQUIREMENTS SUCH AS WARNING LIGHTS, BARRICADES, DELINEATORS, FRAMES FOR SIGNS, CONES, POLES, DRUMS, FLAGMEN, AND PROJECT SIGNS.

(2) IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO FURNISH AND MAINTAIN, AND REMOVE WHEN THE WORK HAS BEEN ACCEPTED BY THE CITY, ANY AND ALL SIGNS, LIGHTS, BARRICADES, FLASHING DIRECTIONAL ARROWS, FLAGMEN, ETC. NECESSARY FOR THE SAFETY OF THE GENERAL PUBLIC, INCLUDING BOTH VEHICULAR AND PEDESTRIAN TRAFFIC.

(3) THE CONTRACTOR SHALL FURNISH, INSTALL, AND MAINTAIN AMBER WARNING LIGHTS AT ALL LOCATIONS NECESSARY FOR THE CONTROL AND PROTECTION OF VEHICULAR TRAFFIC. WARNING LIGHTS PLACED AT OR ON WARNING SIGNS SHALL BE FLASHING LIGHTS. WARNING LIGHTS USED AT LOCATIONS OF WORK AREA SHALL BE STEADY-BURN LIGHTS. AMBER WARNING LIGHTS SHALL BE BATTERY POWER LIGHTS CONFORMING TO THE INSTITUTE OF TRANSPORTATION ENGINEERS (ITE) STANDARD FOR FLASHING AND STEADY-BURN BARRICADE WARNING LIGHTS.

(4) TRAFFIC CONTROL FOR STREET TO RECEIVE PAVEMENT OVERLAY: THE CONTRACTOR SHALL PROVIDE ALL SIGNS, LIGHTS, BARRICADES, FLAGMEN, ETC. NECESSARY FOR THE SAFE CONTROL OF TRAFFIC. THE CONTRACTOR SHALL PROVIDE AND PLACE NO PARKING SIGNS ON STREETS THAT ARE TO BE OVERLAID. THESE SIGNS SHALL BE PLACED NOT MORE THAN 36 HOURS IN ADVANCE OF RESURFACING WORK AND NO LESS THAN 24 HOURS PRIOR TO WORK.

(5) THE CONTRACTOR SHALL MAINTAIN LOCAL RESIDENT AND BUSINESS ACCESS ON ALL STREETS DURING CONSTRUCTION OF ALL IMPROVEMENTS ON THIS PROJECT. TRAFFIC MAINTENANCE SHALL COMPLY WITH THE LATEST REVISION OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 512 - MAINTAINING TRAFFIC, AND SECTION 701 - TRAFFIC

SIGNS, AS WELL AS OTHER APPLICABLE SECTIONS. WHILE WORKING IN STREET RIGHTS-OF-WAY, TRAFFIC IS TO BE MAINTAINED IN SUCH A MANNER AS TO PROVIDE SAFE PASSAGE OF THE PUBLIC THROUGH THE CONSTRUCTION PROJECT AT ALL TIMES. FLAGGING SHOULD ONLY BE EMPLOYED WHEN REQUIRED TO CONTROL TRAFFIC OR WHEN ALL OTHER METHODS OF TRAFFIC CONTROL ARE INADEQUATE TO WARN AND DIRECT DRIVERS. FLAGGERS MUST BE CERTIFIED AS HAVING TAKEN THE VDOT FLAGGING COURSE AND HAVE THE CERTIFICATION CARD WITH THEM WHILE FLAGGING. AT LEAST ONE LANE OF TRAFFIC SHALL BE MAINTAINED AT ALL TIMES. WHILE WORK IS NOT IN PROGRESS, TRAFFIC IS TO BE RETURNED TO THE NORMAL FASHION. WHEN TWO-WAY TRAFFIC IS REQUIRED, THE CONTRACTOR SHALL CONSTRUCT WITHIN THE RIGHT OF WAY SUITABLE DETOURS AROUND THE WORK.

WHEN TRAFFIC SIGNALS OR THEIR APPURTENANCES ARE LIKELY TO BE DAMAGED OR INTERFERE AS A RESULT OF THE CONSTRUCTION, COORDINATE TEMPORARY OPERATION WITH THE CITY OF LYNCHBURG TRAFFIC ENGINEER UNLESS OTHERWISE APPROVED BY CITY OF LYNCHBURG TRAFFIC ENGINEER. PROVIDE 7 DAYS NOTICE PRIOR TO ANTICIPATED DISTURBANCE OR INTERRUPTION.

WHENEVER IT BECOMES NECESSARY TO LEAVE A SECTION OF TRENCH OPEN AFTER COMPLETION OF THE DAYS WORK, THE CONTRACTOR SHALL PROVIDE BARRICADES AND LIGHTS TO PROTECT THE PUBLIC. OPERATE WARNING LIGHTS DURING HOURS FROM DUSK TO DAWN EACH DAY AND AS OTHERWISE REQUIRED FOR INCLEMENT WEATHER AND VISIBILITY. APPROVAL FROM CITY ENGINEER SHALL BE ACQUIRED PRIOR TO LEAVING TRENCH OPEN.

THE CONTRACTOR SHALL PROMPTLY REMOVE ANY EXCAVATED MATERIAL OR OTHER DEBRIS THAT MAY BE SPILLED OR TRACKED ONTO THE TRAVELED PAVEMENT DURING THE CONDUCT OF HIS WORK.

THE CONTRACTOR SHALL NOTIFY LYNCOM (847-1602) ON A DAILY BASIS UNTIL SUCH TIME AS ROADS ARE RETURNED TO NORMAL OPERATION.

WHEN ROADWORK IS SCHEDULED FOR MAJOR THOROUGHFARES OR EXPRESSWAYS, THE CONTRACTOR CANNOT OBSTRUCT THE ROADWAY BEFORE 8:30 A.M. OR AFTER 3:30 P.M.

1.09 MATERIALS AND EQUIPMENT

A. QUALITY: MATERIAL AND EQUIPMENT INCORPORATED INTO THE WORK

(1) CONFORM TO APPLICABLE SPECIFICATIONS AND STANDARDS.

(2) COMPLY WITH SIZE, MAKE, TYPE, AND QUALITY SPECIFIED, OR AS SPECIFICALLY APPROVED IN WRITING BY THE OWNER.

(3) MANUFACTURED AND FABRICATED PRODUCTS

DESIGN, FABRICATE, AND ASSEMBLE IN ACCORDANCE WITH THE BEST ENGINEERING AND SHOP PRACTICES.

MANUFACTURE LIKE PARTS OF DUPLICATE UNITS TO STANDARD SIZES AND GAGES, TO BE INTERCHANGEABLE.

TWO OR MORE ITEMS OF THE SAME KIND SHALL BE IDENTICAL, BY THE SAME MANUFACTURER.

PRODUCTS SHALL BE SUITABLE FOR SERVICE CONDITIONS.

EQUIPMENT CAPACITIES, SIZES, AND DIMENSIONS SHOWN OR SPECIFIED SHALL BE ADHERED TO UNLESS VARIATIONS ARE SPECIFICALLY APPROVED IN WRITING.

(4) DO NOT USE MATERIAL OR EQUIPMENT FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS DESIGNED OR IS SPECIFIED.

(5) EXCEPT AS SPECIFICALLY INDICATED OR SPECIFIED, MATERIALS AND EQUIPMENT REMOVED FROM THE EXISTING STRUCTURE SHALL NOT BE USED IN THE COMPLETED WORK.

(6) FOR MATERIAL AND EQUIPMENT SPECIFICALLY INDICATED OR SPECIFIED TO BE REUSED IN THE WORK:

USE SPECIAL CARE IN REMOVAL, HANDLING, STORAGE, AND REINSTALLATION TO ASSURE PROPER FUNCTION IN THE COMPLETED WORK.

ARRANGE FOR TRANSPORTATION, STORAGE, AND HANDLING OF PRODUCTS, WHICH REQUIRE OFF-SITE STORAGE, RESTORATION, OR RENOVATION. PAY ALL COSTS FOR SUCH WORK.

(7) MANUFACTURER'S INSTRUCTIONS

WHEN CONTRACT DOCUMENTS REQUIRE THAT INSTALLATION OF WORK SHALL COMPLY WITH MANUFACTURER'S PRINTED INSTRUCTIONS, OBTAIN AND DISTRIBUTE COPIES OF SUCH INSTRUCTIONS TO PARTIES INVOLVED IN THE INSTALLATION.

MAINTAIN ONE SET OF COMPLETE INSTRUCTIONS AT THE JOB SITE DURING INSTALLATION AND UNTIL COMPLETION.

HANDLE, INSTALL, CONNECT, CLEAN, CONDITION, AND ADJUST PRODUCTS IN ACCORDANCE WITH SUCH INSTRUCTIONS AND IN CONFORMITY WITH SPECIFIED REQUIREMENTS.

DO NOT PROCEED WITH WORK WITHOUT CLEAR INSTRUCTIONS.

PERFORM WORK IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. DO NOT OMIT ANY PREPARATORY STEP OR INSTALLATION PROCEDURE UNLESS SPECIFICALLY MODIFIED OR EXEMPTED BY CONTRACT DOCUMENTS.

B. TRANSPORTATION AND HANDLING

(1) ARRANGE DELIVERIES OF PRODUCTS IN ACCORDANCE WITH CONSTRUCTION SCHEDULES. COORDINATE TO AVOID CONFLICT WITH WORK AND CONDITIONS AT THE SITE.

DELIVER PRODUCTS IN UNDAMAGED CONDITION, IN MANUFACTURER'S ORIGINAL CONTAINERS OR PACKAGING, WITH IDENTIFYING LABELS INTACT AND LEGIBLE.

IMMEDIATELY ON DELIVERY, INSPECT SHIPMENTS TO ASSURE COMPLIANCE WITH REQUIREMENTS OF CONTRACT DOCUMENTS AND APPROVED SUBMITTALS, AND THAT PRODUCTS ARE PROPERLY PROTECTED AND UNDAMAGED.

(2) PROVIDE EQUIPMENT AND PERSONNEL TO HANDLE PRODUCTS BY METHODS TO PREVENT SOILING OR DAMAGE TO PRODUCTS OR PACKAGING.

C. STORAGE AND PROTECTION

(1) STORE PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, WITH SEALS AND LABELS INTACT AND LEGIBLE.

STORE PRODUCTS SUBJECT TO DAMAGE BY THE ELEMENTS IN WEATHERTIGHT ENCLOSURES.

MAINTAIN TEMPERATURE AND HUMIDITY WITHIN THE RANGES REQUIRED BY MANUFACTURER'S INSTRUCTIONS.

(2) EXTERIOR STORAGE

STORE FABRICATED PRODUCTS ABOVE THE GROUND, ON BLOCKING OR SKIDS; PREVENT SOILING OR STAINING; COVER PRODUCTS WHICH ARE SUBJECT TO DETERIORATION WITH IMPERVIOUS SHEET COVERINGS; AND PROVIDE ADEQUATE VENTILATION TO AVOID CONDENSATION.

STORE LOOSE GRANULAR MATERIALS IN A WELL-DRAINED AREA ON SOLID SURFACES TO PREVENT MIXING WITH FOREIGN MATTER.

(3) ARRANGE STORAGE IN A MANNER TO PROVIDE EASY ACCESS FOR INSPECTION. MAKE PERIODIC INSPECTIONS OF STORED PRODUCTS TO ASSURE THAT PRODUCTS ARE MAINTAINED UNDER SPECIFIED CONDITIONS AND FREE FROM DAMAGE OR DETERIORATION.

(4) PROTECTION AFTER INSTALLATION: PROVIDE SUBSTANTIAL COVERINGS AS NECESSARY TO PROTECT INSTALLED PRODUCTS FROM DAMAGE FROM TRAFFIC AND SUBSEQUENT CONSTRUCTION OPERATIONS. REMOVE WHEN NO LONGER NEEDED.

D. PROJECT SUBSTITUTIONS

(1) SUBSTITUTIONS: THE CONTRACTOR MAY OFFER WITH HIS BID, SUBSTITUTE ITEMS OF EQUIPMENT AND MATERIALS TO THOSE OF SPECIFIED MANUFACTURERS CALLED FOR IN THE SPECIFICATION SECTIONS, PROVIDED THAT, IF APPROVED:

NO MAJOR CHANGES IN THE CONSTRUCTION OR DESIGN INTENT OF THE PROJECT WOULD BE REQUIRED. CHANGES REQUIRED TO

ACCOMMODATE SUBSTITUTED ITEMS SHALL BE MADE BY THE CONTRACTOR AT NO ADDITIONAL COST OR TIME DELAY.

FEATURES OF QUALITY, CAPACITY, CONSTRUCTION, PERFORMANCE, APPEARANCE, SIZE, ARRANGEMENT, AND GENERAL UTILITY INCLUDING ECONOMY OF OPERATION OF SUBSTITUTES OFFERED, EITHER PARALLEL OR EXCEED THOSE OF SPECIFIED PRODUCTS.

THE PROVISIONS OF ARTICLE 6.30 OF THE GENERAL CONDITIONS AND ANY OTHER GUARANTEES, IF REQUIRED BY THE SPECIFICATION SECTIONS, SHALL APPLY IN FULL FORCE AND EFFECT TO THE PERFORMANCE OF SUCH SUBSTITUTE PRODUCTS APPROVED FOR INCORPORATION INTO THE WORK.

(2) TECHNICAL DATA COVERING THE PROPOSED SUBSTITUTION SHALL BE FURNISHED WITH THE BID WHEN POSSIBLE, AND NOT LATER THAN 10 DAYS AFTER BID SUBMISSION.

1.10 THE CONTRACTOR SHALL GIVE HIS PERSONAL SUPERINTENDENCE TO THE WORK AND SHALL ASSIGN A SPECIFIC PROJECT SUPERINTENDENT, EXPERIENCED WITH URBAN UTILITY WORK, TO THE PROJECT. THIS SUPERINTENDENT SHALL BE PRESENT ON THE WORK SITE AT ALL TIMES DURING PROGRESS, ANY ABSENCES SHALL BE COORDINATED WITH THE ENGINEER, AND SATISFACTORY COVERAGE PROVIDED TO ENSURE ADEQUATE SUPERINTENDENCE OF WORK. THE PROJECT SUPERINTENDENT SHALL BE FULLY COMPETENT AND HAVE FULL AUTHORITY TO ACT FOR THE CONTRACTOR, AND SHALL PROVIDE EVIDENCE OF COMPETENCY SATISFACTORY TO THE ENGINEER.

1.11 THE CONTRACTOR SHALL HAVE POSTED IN A CONSPICUOUS SPOT WITH HIS EQUIPMENT AND ON THE WORK SITE, A SIGN OR STICKER IDENTIFYING HIS EQUIPMENT AS TO ITS OWNER AND AN EMERGENCY 24-HOUR PHONE NUMBER.

1.12 THE CONTRACTOR SHALL DESIGNATE A RESPONSIBLE MEMBER OF HIS ORGANIZATION AT THE SITE WHOSE DUTY SHALL BE THE PREVENTION OF ACCIDENTS AND COMPLIANCE WITH OSHA CONFINED SPACE AND TRENCH SAFETY PROCEDURES.

1.13 CONTRACT CLOSEOUT SHALL INCLUDE THE FOLLOWING:

A. PUNCH LIST: CORRECT ALL PUNCH LIST ITEMS.

B. CLEANING: CLEAN UP ALL DEBRIS; REMOVE STAINS, SPOTS, MARKS, AND DIRT; REMOVE PAINT SPOTS AND SMEARS FROM ALL SURFACES; AND CLEAN APPURTENANCES.

C. PROJECT RECORD DOCUMENTS

(1) PROVIDE ONE COMPLETE SET OF DRAWINGS AND THE PROJECT MANUAL RECORDING ALL CHANGES TO THE WORK TO INDICATE ACTUAL INSTALLATION. THE CONTRACTOR IS TO NOTE CHANGES IN LEGIBLE RED LETTERS AT LEAST 1/8-INCH HIGH. THE CONTRACTOR WILL BE RESPONSIBLE FOR ACCURATELY RECORDING THE LENGTHS OF INSTALLED PIPE AND VERTICAL HEIGHTS OF CLEANOUTS AND MANHOLES AS THEY ARE INSTALLED. THE CONTRACTOR SHALL NOTE THE STRUCTURE/LOT ADDRESS AND THE DISTANCE TO THE NEAREST MANHOLE ON THE DRAWINGS FOR ALL SANITARY SERVICES INSTALLED. FOR ALL NEW WATER SERVICES, THE STRUCTURE/LOT ADDRESS AND THE DISTANCE ALONG THE MAIN LINE FROM THE SERVICE CORPORATION STOP TO THE NEAREST MAIN LINE VALVE SHALL BE NOTED ON THE DRAWINGS. ALL EXISTING AND NEWLY INSTALLED WATER VALVES AND CORPORATION STOPS SHALL ALSO BE

ANNOTED ON DRAWINGS. THIS INFORMATION WILL BE REVIEWED AT MONTHLY PROGRESS MEETINGS AND WILL BE USED AS A BASIS FOR PAY REQUESTS. THE END OF PROJECT AS-BUILT SURVEY BY A LICENSED SURVEYOR SHALL RECORD THE NORTHING, EASTING, AND RIM ELEVATION COORDINATES OF ALL MANHOLES AND CLEANOUTS, DEFLECTIONS TO UPSTREAM MANHOLES, AND THE INVERT ELEVATIONS OF ALL PIPES IN NEWLY INSTALLED MANHOLES. THE SURVEYOR SHALL USE THIS ELECTRONIC INFORMATION TO CALCULATE MANHOLE-TO-MANHOLE LENGTHS AND SLOPES FOR ALL NEWLY INSTALLED PIPES. THE RECORD SURVEY SHALL ALSO LOCATE ALL VALVES, FIRE HYDRANTS, AND ASSOCIATED WATER MAIN IMPROVEMENTS. THE CONTRACTOR'S RECORD DRAWING SUBMITTAL SHALL INCLUDE A DIGITAL AND HARDCOPY PRINTOUT OF THIS AS-BUILT SURVEY AND CALCULATED INFORMATION IN TABULAR FORMAT - INCLUDING THE SURVEYORS FEATURE CODE LEGEND, A DIGITAL COPY OF THE SURVEYOR'S ORIGINAL AS-BUILT SURVEY INFORMATION IN ASCII FORMAT, AND A FINAL COPY OF THE CONTRACTOR'S REDLINED CONSTRUCTION DRAWINGS NOTING ALL AS INSTALLED CONDITIONS. THESE THREE ITEMS WILL THEN BE CONSOLIDATED BY THE ENGINEER TO PROVIDE ONE SET OF DIGITAL RECORD DRAWINGS FOR THE CITY.

(2) THESE RECORDS ARE A SPECIFIC CONTRACT REQUIREMENT, AND FINAL PAYMENT WILL NOT BE MADE UNTIL THESE DRAWINGS AND PROJECT MANUAL HAVE BEEN SUBMITTED IN AN ACCEPTABLE FORM.

D. GUARANTEES, WARRANTIES, AND BONDS: SUBMIT ALL REQUIRED GUARANTEES, WARRANTIES, AND BONDS.

E. LIST OF MANUFACTURERS AND SUPPLIERS: AT THE CONCLUSION OF THE PROJECT, THE CONTRACTOR SHALL SUBMIT A COMPLETE LIST OF SUBCONTRACTORS, MANUFACTURERS, AND SUPPLIERS WHO PARTICIPATED IN THE CONSTRUCTION OR WHO FURNISHED MATERIALS OR EQUIPMENT. THE ADDRESS OF EACH FIRM SHALL BE INCLUDED, TOGETHER WITH TYPES OF MATERIALS OR WORK PERFORMED.

F. AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS.

G. CONSENT OF SURETY TO FINAL PAYMENT AIA FORM G707 IF RETAINAGE IS IN ESCROW ACCOUNT.

H. TELEVISING OF LINES: THE CITY RESERVES THE RIGHT TO TELEVISE ANY SEWER OR STORM LINE AS A PREREQUISITE TO FINAL ACCEPTANCE.

END OF SECTION

SECTION 02100 - SITE PREPARATION

1. GENERAL

1.01 PROVIDE BARRICADES, COVERINGS, OR OTHER TYPES OF PROTECTION NECESSARY TO PREVENT DAMAGE TO EXISTING IMPROVEMENTS NOT INDICATED TO BE REMOVED, AND IMPROVEMENTS ON ADJOINING PROPERTIES.

A. RESTORE ALL IMPROVEMENTS DAMAGED BY THIS WORK TO THEIR ORIGINAL CONDITION, AND ACCEPTABLE TO THE OWNER OR OTHER PARTIES OR AUTHORITIES HAVING JURISDICTION, UNLESS INDICATED OTHERWISE. DAMAGES CAUSED BY CONTRACTOR ACCIDENT, NEGLIGENCE, ERROR, CARELESSNESS, OR WHICH COULD HAVE BEEN REASONABLY AVOIDED WITHOUT UNDUE IMPACT TO CONSTRUCTION METHODS SHALL BE REPAIRED AT CONTRACTOR EXPENSE.

1.02 PROTECT EXISTING TREES AND OTHER VEGETATION INDICATED TO REMAIN IN PLACE AGAINST CUTTING, BREAKING, OR SKINNING OF ROOTS; SKINNING AND BRUISING OF BARK; SMOTHERING OF TREES BY STOCKPILING CONSTRUCTION MATERIALS OR EXCAVATED MATERIALS WITHIN DRIP LINE; EXCESS FOOT OR VEHICULAR TRAFFIC; OR PARKING OF VEHICLES WITHIN DRIP LINE. PROVIDE TEMPORARY FENCES, BARRICADES, OR GUARDS AS REQUIRED TO PROTECT TREES AND VEGETATION TO BE LEFT STANDING. TREES AND VEGETATION WHICH ARE WOUNDED OR STRESSED DUE TO FAILURE TO ADHERE TO THE ABOVE STANDARDS OF CARE SHALL BE RESTORED, REMOVED, AND/OR REPLACED AT CONTRACTOR EXPENSE AT THE DIRECTION OF THE ENGINEER. RESTORATION FOR UNAVOIDABLE IMPACTS WILL BE PAID FOR IN ACCORDANCE WITH BID SCHEDULE ITEMS.

1.03 BURNING WILL NOT BE PERMITTED.

1.04 STORE AND USE EXPLOSIVES IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AND SHALL SATISFACTORILY CORRECT ALL DAMAGE RESULTING FROM USE OF EXPLOSIVES.

2. PRODUCTS: NOT USED

3. EXECUTION

3.01 LAND DISTURBING AND CONSTRUCTION LIMITS CRITERIA FOR SEWER, WATER, AND STORM LINE CONSTRUCTION

A. GENERAL REQUIREMENTS APPLYING TO ALL AREAS:

(1) CONTRACTOR SHALL PLAN CONSTRUCTION TO MINIMIZE DISTURBANCE TO PROPERTIES ADJACENT TO THE SEWER, WATER, AND STORM LINES. CONTRACTOR SHALL FLAG THE PROPOSED LIMITS OF CONSTRUCTION AND MARK ALL TREES PROPOSED TO BE CUT FOR REVIEW AND APPROVAL BY THE ENGINEER PRIOR TO ANY CLEARING BEING PERFORMED. THE CONTRACTOR SHALL USE APPROPRIATELY SIZED EQUIPMENT FOR UTILITY INSTALLATION, TO LIMIT IMPACTS TO MINIMUM NECESSARY FOR UTILITY INSTALLATION.

(2) THE ENGINEER RESERVES THE RIGHT TO LIMIT THE WIDTH OF LAND TO BE DISTURBED AND TO DESIGNATE ON THE DRAWINGS OR IN THE FIELD CERTAIN AREAS OR ITEMS WITHIN THIS WIDTH TO BE PROTECTED FROM DAMAGE.

(3) THE CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGES TO AREA OR ITEMS DESIGNATED BY THE ENGINEER TO BE PROTECTED OR OUTSIDE CONSTRUCTION EASEMENT. REPAIRS TO, REPLACEMENT OF, OR REPARATIONS FOR AREAS OR ITEMS DAMAGED SHALL BE MADE TO THE SATISFACTION OF THE ENGINEER AT CONTRACTOR EXPENSE BEFORE ACCEPTANCE OF THE COMPLETED PROJECT.

(4) UNLESS OTHERWISE NOTED ON THE DRAWINGS, ALL TREES WITH DIAMETERS OF 6 INCHES OR LARGER, MEASURED AT THE BASE, CUT ON ANY PROJECT, SHALL BE CUT INTO FIREPLACE LENGTHS, 24 INCHES, AND STACKED WITHIN THE "CONSTRUCTION LIMITS" AT A LOCATION SUITABLE TO THE PROPERTY OWNER. BRUSH, LAPS, ROOTS, AND STUMPS FROM TREES SHALL BE REMOVED FROM THE SITE. IN UNDEVELOPED AREAS, THE CONTRACTOR WILL BE ALLOWED TO LEAVE STUMPS UNDISTURBED PROVIDED THE TREE IS CUT WITHIN 6 INCHES OF THE FINISH GRADE, STUMPS SHALL BE REMOVED WHEN THEY ARE LOCATED WITHIN FILL SECTION LIMITS FOR STORMWATER MANAGEMENT FACILITIES, OR DRAINAGE SWALES.

(5) ALL BUILDINGS OR STRUCTURES LOCATED ALONG THE LINE SHALL BE PROTECTED BY THE CONTRACTOR. HAND TRENCHING, SHORING, OR OTHER METHODS MAY BE REQUIRED.

(6) ANY FENCES DISTURBED BY THE CONTRACTOR SHALL BE REPAIRED WITH NEW MATERIALS TO A CONDITION EQUAL TO OR BETTER THAN THEIR ORIGINAL CONDITION OR TO THE SATISFACTION OF THE ENGINEER.

(7) CONTRACTOR SHALL LIMIT WIDTH OF DISTURBED AREA THROUGH GARDEN AND LAWN AREAS TO A WIDTH ABSOLUTELY NECESSARY FOR CONSTRUCTION. PRIOR TO CONSTRUCTION, TOPSOIL AND TURF SHALL BE STRIPPED FROM AREAS OF GARDEN OR LAWN TO BE DISTURBED BY CONTRACTOR FOR A DEPTH OF 6 INCHES AND STOCKPILED NEAR GARDEN. AFTER BACKFILLING PIPE, TOPSOIL SHALL BE LOOSELY SPREAD OVER ALL DISTURBED AREAS TO A DEPTH OF AT LEAST 6 INCHES, AND TURF REINSTATED.

(8) CONTRACTOR SHALL OBTAIN WRITTEN PERMISSION FROM PROPERTY OWNERS FOR USE OF ANY ACCESS ROADS OTHER THAN ONES LOCATED WITHIN RIGHTS-OF-WAY. WRITTEN PERMISSION SHALL CONTAIN CONDITIONS FOR USE AND RESTORATION AGREEMENTS BETWEEN PROPERTY OWNER AND CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND COMPLYING WITH ALL RELEVANT LOCAL, STATE, AND FEDERAL PERMITS ASSOCIATED WITH WORK ON PRIVATE PROPERTY.

(9) ALL AREAS DISTURBED SHALL BE RESTORED TO A CONDITION EQUAL TO OR BETTER THAN THEIR ORIGINAL CONDITION AND SHALL BE GRADED TO DRAIN.

(10) THE CONTRACTOR SHALL REPLACE OR REPAIR ALL DAMAGED OR DESTROYED HEDGE ROWS OR PROPERTY CORNERS. PROPERTY CORNERS REMOVED DURING CONSTRUCTION SHALL BE REPLACED BY A SURVEYOR LICENSED TO PRACTICE BOUNDARY SURVEYS IN VIRGINIA.

(11) BEFORE CROSSING OR ENTERING INTO ANY JURISDICTIONAL WETLANDS, CONTRACTOR SHALL VERIFY WHETHER OR NOT A WETLANDS PERMIT HAS BEEN OBTAINED FOR THE ENCROACHMENT AND WHETHER SPECIAL RESTRICTIONS HAVE BEEN IMPOSED. CARE SHALL BE TAKEN TO PREVENT DRAINING OR OTHERWISE DESTROYING ALL WETLAND AREAS. RESTORE AS STATED ON EITHER THE PROJECT DRAWINGS, THE CONTRACT DOCUMENTS, AND/OR AS NOTED IN THE PERMIT.

(12) CONTRACTOR SHALL PROTECT EXISTING TREES AND OTHER VEGETATION INDICATED BY THE CITY ENGINEER TO REMAIN IN PLACE AGAINST CUTTING, BREAKING, OR SKINNING OF ROOTS, SKINNING AND BRUISING OF BARK, SMOTHERING OF TREES BY STOCKPILING CONSTRUCTION MATERIALS OR EXCAVATED MATERIALS WITHIN DRIP LINE, EXCESS FOOT OR VEHICULAR TRAFFIC, OR PARKING OF VEHICLES WITHIN DRIP LINE. PROVIDE TEMPORARY FENCES OR BARRICADES AS REQUIRED TO PROTECT TREES AND VEGETATION TO BE LEFT STANDING AT NO ADDITIONAL COST.

TREES AND SHRUBS THAT ARE TO REMAIN WITHIN THE CONSTRUCTION LIMITS WILL BE INDICATED ON THE DRAWINGS OR CONSPICUOUSLY MARKED ON SITE.

CLEARING SHALL CONSIST IN THE FELLING, CUTTING UP, AND SATISFACTORY DISPOSAL OF TREES AND OTHER VEGETATION DESIGNATED FOR REMOVAL IN ACCORDANCE WITH THESE SPECIFICATIONS.

GRUBBING SHALL CONSIST OF THE REMOVAL OF ROOTS 1 1/2-INCH AND LARGER, ORGANIC MATTER AND DEBRIS, AND STUMPS HAVING A DIAMETER OF THREE INCHES OR LARGER, TO A DEPTH OF AT LEAST 18 INCHES BELOW THE SURFACE AND OR SUBGRADE; WHICH EVER IS LOWER, AND THE DISPOSAL THEREOF.

CAREFULLY AND CLEANLY CUT ROOTS AND BRANCHES OF TREES INDICATED TO REMAIN WHERE THE ROOTS AND BRANCHES OBSTRUCT CONSTRUCTION OF THE UTILITY LINE. THE CONTRACTOR SHALL PROVIDE PROTECTION FOR ROOTS AND BRANCHES OVER 1.5 INCHES IN DIAMETER THAT ARE CUT DURING CONSTRUCTION OPERATIONS. TEMPORARILY COVER ALL EXPOSED ROOTS WITH WET BURLAP TO PREVENT ROOTS FROM DRYING OUT. PROVIDE EARTH COVER AS SOON AS POSSIBLE.

DAMAGED TREES AND VEGETATION DESIGNATED TO REMAIN SHALL BE REPAIRED OR REPLACED AT CONTRACTOR'S EXPENSE IN A MANNER ACCEPTABLE TO THE CITY ENGINEER IF THEY ARE DAMAGED BY CONSTRUCTION OPERATIONS. REPAIR TREE DAMAGE AS DIRECTED BY A QUALIFIED TREE SURGEON.

(13) PRIOR TO BEGINNING GRADING OR EMBANKMENT OPERATIONS IN ANY AREA, ALL NECESSARY CLEARING AND GRUBBING IN THAT AREA SHALL HAVE BEEN COMPLETED. SHOULD THE CONTRACTOR, THROUGH NEGLIGENCE OR FAULT, EXCAVATE BELOW THE DESIGNATED GRADES, HE SHALL REPLACE THE EXCAVATION WITH APPROVED SATISFACTORY MATERIALS, IN AN APPROVED METHOD, AT HIS OWN EXPENSE. ALL MATERIAL DETERMINED UNSATISFACTORY SHOULD BE DISPOSED OF IN WASTE AREAS AS DIRECTED. TOPSOIL SHALL NOT BE USED IN EMBANKMENTS BUT SHALL BE HANDLED AND PLACED AS DIRECTED. THE CONTRACTOR SHALL SATISFY HIMSELF AS TO THE CHARACTER, QUANTITY, AND DISTRIBUTION OF ALL MATERIALS TO BE EXCAVATED. NO PAYMENT WILL BE MADE FOR ANY EXCAVATED MATERIAL THAT IS USED FOR PURPOSES OTHER THAN THOSE DESIGNATED.

B. SPECIFIC REQUIREMENTS APPLYING TO DEVELOPED SUBDIVISIONS AND LOTS

(1) ALL TREES LOCATED BEYOND 7.5 FEET OF THE CENTERLINE SHALL BE PROTECTED BY THE CONTRACTOR UNLESS THE CONTRACTOR OBTAINS

WRITTEN AUTHORIZATION FROM THE ENGINEER TO REMOVE THEM. THE ENGINEER RESERVES THE RIGHT TO DESIGNATE OTHER TREES LOCATED CLOSER TO THE CENTERLINE FOR PROTECTION WHERE POSSIBLE.

(2) ALL SHRUBS, HEDGES, OR OTHER ORNAMENTAL PLANTINGS LOCATED ALONG THE LINE SHALL BE PROTECTED OR MOVED AND REPLANTED BY THE CONTRACTOR.

(3) SEPTIC SYSTEMS, WELLS, OR SPRINGS LOCATED WITHIN 50 FEET OF THE CENTERLINE SHALL BE PROTECTED BY THE CONTRACTOR.

(4) CONTRACTOR SHALL GRUB ONLY BRUSH, ROOTS, AND STUMPS OF REMOVED TREES. DAMAGE TO LAWNS SHALL BE KEPT TO AN ABSOLUTE MINIMUM NECESSARY FOR CONSTRUCTION.

(5) EXCAVATED OR BLASTED ROCK SHALL BE REMOVED FROM THE SITE UNLESS OTHERWISE ORDERED BY THE ENGINEER.

(6) RESTORATION AND FINE GRADING SHALL FOLLOW WITHIN 1 WEEK FROM THE TIME AN AREA IS DISTURBED OR WITHIN 500 FEET FROM THE IMMEDIATE WORK SITE, WHICHEVER OCCURS FIRST. SEEDING SHALL FOLLOW AS ORDERED BY THE ENGINEER.

C. SPECIFIC REQUIREMENTS APPLYING TO UNDEVELOPED AREAS

(1) ALL TREES 12 INCHES IN DIAMETER OR LARGER LOCATED BEYOND 7.5 FEET OF THE CENTERLINE SHALL BE PROTECTED UNLESS CONTRACTOR OBTAINS WRITTEN AUTHORIZATION FROM ENGINEER TO REMOVE THEM. ENGINEER RESERVES THE RIGHT TO DESIGNATE SELECT TREES LOCATED CLOSER TO CENTERLINE FOR PROTECTION WHERE POSSIBLE.

(2) IN AREAS WHERE ANIMALS ARE KEPT, CONTRACTOR SHALL NOTIFY PROPERTY OWNER PRIOR TO COMMENCING WORK AND KEEP OWNER ADVISED OF PROGRESS OF WORK. FENCES SHALL BE KEPT SECURE AT ALL TIMES AND ANIMALS PROTECTED FROM OPEN DITCHES, MACHINERY, BLASTING, AND OTHER HAZARDS.

(3) ALL AREAS SHALL BE GRUBBED AND CLEARED OF STUMPS AND ROOTS.

(4) RESTORATION AND FINE GRADING SHALL FOLLOW WITHIN 1 WEEK FROM THE TIME AN AREA IS DISTURBED OR WITHIN 1,000 FEET FROM THE IMMEDIATE WORK SITE, WHICHEVER OCCURS FIRST. SEEDING SHALL FOLLOW AS ORDERED BY THE ENGINEER.

(5) WHEN WORKING IN WOODED AREAS, THE CONTRACTOR MAY CONSTRUCT SMALL BRUSH PILES FOR BIRDS AND WILDLIFE INSTEAD OF HAULING OFF OR MULCHING THE BRUSH. THE BRUSH PILES SHALL NOT CONTAIN STUMPS, LARGE LIMBS, ROCKS, BRICK, BLOCK, DIRT, BROKEN PAVEMENT, BROKEN CONCRETE, PAPER, YARD WASTE, OR SCRAP METAL. THE BRUSH PILE SHALL BE CONSTRUCTED ONLY ON CITY OWNED EASEMENTS, RIGHT-OF-WAYS, OR WITH SPECIFIC WRITTEN LAND OWNER PERMISSION.

D. CONSTRUCTION LIMITS

(1) CONTRACTOR SHALL NOT DISTURB ANY AREAS OUTSIDE THE FOLLOWING LIMITS SPECIFIED IN THIS SECTION WITHOUT EXPRESS WRITTEN PERMISSION FROM THE ENGINEER.

(2) NO "CLEAR CUTTING" OF TIMBER SHALL BE PERMITTED WITHIN THE CONSTRUCTION LIMITS. CONTRACTOR SHALL MAKE SELECT CUTTING OF TREES, TAKING SMALLEST TREES FIRST, THAT ARE MANDATORY FOR THE CONSTRUCTION OF THE SEWER LINE. ENGINEER'S DECISION SHALL BE FINAL ON DETERMINATION OF WHICH TREES ARE TO BE CUT.

(3) THE FOLLOWING WIDTHS MEASURED FROM THE CENTERLINE OF THE SEWER, WATER, AND STORM LINES SHALL BE CONSIDERED THE MAXIMUM ALLOWABLE WORKING AREA AND BE REFERRED TO AS "CONSTRUCTION LIMIT."

PIPE SIZE	DISTANCE FROM C/L	TOTAL ALLOWABLE WIDTH
12-INCH OR SMALLER	15 FEET	30 FEET
15-INCH TO 18-INCH	20 FEET	40 FEET
24-INCH AND UP	25 FEET	50 FEET

ALL AREAS OUTSIDE THESE CONSTRUCTION LIMITS SHALL BE PROTECTED BY THE CONTRACTOR UNLESS WRITTEN VARIATIONS ARE GRANTED BY THE ENGINEER. ANY GRADING OR EXCAVATION REQUIRED OUTSIDE THESE LIMITS FOR EQUIPMENT TRAVEL DURING THE COURSE OF CONSTRUCTION AS WELL AS EROSION CONTROL, ACCESS OR HAUL ROAD INSTALLATION AND REMOVAL, RESTORATION, SEEDING AND GROUND COVER SHALL BE PROVIDED AT CONTRACTOR EXPENSE. THIS INCLUDES REDISTURBANCE OF STABILIZED AREAS DUE TO CONSTRUCTION SEQUENCING OR OTHER ACCESS REQUIREMENTS, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

3.02 DEMOLITION

A. WHEN AN EXISTING MANHOLE OR DROP INLET IS DESIGNATED TO BE ABANDONED AND THE STORM LINES, EITHER ENTERING OR EXITING THE MANHOLE HAVE BEEN FILLED WITH FLOWABLE FILL, THE UPPER PORTION OF THE MANHOLE SHALL BE REMOVED TO A MINIMUM OF TWO FEET BELOW THE PROPOSED FINISHED GRADE, A HOLE PUNCHED IN THE BOTTOM OF THE STRUCTURE, AND THE STRUCTURE BACKFILLED WITH VDOT #57 STONE COMPACTED IN 6-INCH LIFTS. THE REMAINING PORTION SHALL BE BACKFILLED WITH STONE OR ASPHALT TO MATCH ROADWAY CROSS-SECTION. IN OFF ROAD AREAS, AASHTO TYPE III GEOTEXTILE WILL BE LAID ON THE STONE BASE AND SUITABLE SOIL MATERIAL COMPACTED ON TOP TO MATCH SURROUNDING GRADE. THE FRAME AND COVERS FROM ALL EXISTING MANHOLES TO BE ABANDONED OR REMOVED SHALL BE SALVAGED AND TRANSPORTED TO THE CITY'S STORAGE YARD AT 6TH AND FLOYD STREETS.

B. ALL ABANDONED VALVE BOXES SHALL BE REMOVED TO 6 INCHES BELOW THE SURFACE AND BACKFILLED WITH LIKE SURFACE MATERIAL. WHEN ABANDONING EXISTING LINES, THE LINE SHALL BE ABANDONED AT ITS SOURCE AND ALL WATER CONTROL DEVICES CLOSED AND A 1-FOOT SEGMENT OF THE LINE SHALL BE REMOVED AT THE WATER CONTROL DEVICE.

C. REMOVE PIPE AT LOCATIONS SHOWN ON THE DRAWINGS OR WHERE NECESSARY FOR CONSTRUCTION OF THE NEW LINE. PLUG PIPES AT EACH END AND AT MANHOLES. WHEN AN EXISTING LINE IS DESIGNATED TO BE ABANDONED IN PLACE, THE LOW END OF THE LINE IS TO BE PLUGGED AND LEAN CONCRETE GROUT (FLOWABLE FILL) SHALL BE PUMPED INTO THE LINE UNTIL LINE IS COMPLETELY FILLED. SALVAGED PIPE SHALL BE TRANSPORTED TO THE CITY'S PIPE STORAGE YARD AT 6TH AND FLOYD STREETS AS DIRECTED BY THE ENGINEER. ALL UNSALVAGEABLE PIPE SHALL BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE PROMPTLY REMOVED FROM THE SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OFF LOADING SALVAGED PIPE AND SCHEDULING DELIVERY 24 HOURS IN ADVANCE.

3.03 CLEAN UP DEBRIS RESULTING FROM SITE CLEARING OPERATIONS CONTINUOUSLY WITH THE PROGRESS OF THE WORK.

3.04 REMOVE PROMPTLY ALL SALVAGEABLE MATERIAL THAT BECOMES PROPERTY OF THE CONTRACTOR AND IS NOT TO BE REUSED IN CONSTRUCTION. SALE OF MATERIAL ON THE SITE IS PROHIBITED. DEBRIS FROM THE SITE SHALL BE REMOVED IN SUCH A MANNER AS TO PREVENT SPILLAGE. KEEP PAVEMENT AND AREA ADJACENT TO SITE CLEAN AND FREE FROM MUD, DIRT, DUST, AND DEBRIS AT ALL TIMES.

3.05 ALL WASTE MATERIAL AND DEBRIS FROM THE PROJECT SHALL BE TAKEN TO THE CITY LANDFILL OR OTHER LANDFILL APPROVED BY THE CITY. THE MATERIAL SHALL BE BROKEN OR CUT INTO PIECES WHICH CAN BE EASILY COMPACTED BY THE LANDFILL EQUIPMENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TIPPING FEES ASSESSED AT ANY LANDFILL.

3.06 REMOVE DEBRIS FROM SITE IN SUCH A MANNER AS TO PREVENT SPILLAGE. KEEP PAVEMENT AND AREA ADJACENT TO SITE CLEAN AND FREE FROM MUD, DIRT, AND DEBRIS AT ALL TIMES.

END OF SECTION

SECTION 02220 - TRENCHING AND BACKFILLING

1. GENERAL

1.01 REFERENCE SPECIFICATIONS WHERE APPLICABLE TO WORK UNDER THIS SECTION ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS.....ASTM

B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS.....AASHTO

1.02 STORAGE AND USE OF EXPLOSIVES SHALL BE IN ACCORDANCE WITH THIS PROJECT MANUAL AND THE NATIONAL FIRE PROTECTION ASSOCIATION'S NFPA 495, EXPLOSIVE MATERIALS CODE, LATEST EDITION, AND THE REQUIREMENTS OF THE STORAGE AND USE PERMIT ISSUED TO THE CONTRACTOR BY THE CITY FIRE MARSHALL. IN THE EVENT OF A DISCREPANCY, THE MORE STRINGENT REQUIREMENTS GOVERN.

1.03 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: A DETAILED BLASTING PLAN AND SCHEDULE INCLUDING PROCEDURES PROPOSED AND QUALIFICATIONS AND REFERENCES OF BLASTING PERSONNEL.

B. SUBMITTAL: A DETAILED PLAN FOR CROSSING STREAMS FOR ACCESS TO CONSTRUCTION SITES.

C. SUBMITTAL: A DETAILED EROSION AND SEDIMENTATION CONTROL PLAN FOR THE PROJECT.

D. SUBMITTAL: FORMAL REGISTRATION STATEMENT AND DETAILED STORMWATER POLLUTION PREVENTION PLAN PREPARED IN ACCORDANCE WITH VPDES GENERAL PERMIT REQUIREMENTS FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES.

E. SUBMITTAL: STABILIZATION AND SEPARATION FABRIC

F. SUBMITTAL: DRAINAGE FABRIC

G. SUBMITTAL: METALLIC LOCATING TAPE

H. SUBMITTAL: PRIOR TO PIPE LAYING OPERATIONS, THE CONTRACTOR SHALL LEASE FOR THE CITY ONE SEISMOGRAPH AND ACCESSORIES.

1.04 COMPACTION TESTS: IN THE COURSE OF BACKFILLING TRENCHES FOR UTILITY INSTALLATIONS, CONSTRUCTING EMBANKMENTS FOR ROADWAYS, AND PLACING AGGREGATE BASE, THE ENGINEER MAY PERFORM "FIELD DENSITY DETERMINATIONS" OR COMPACTION TESTS. WHEN COMPACTION TESTS ARE CALLED FOR BY THE ENGINEER, THE LOCATION OF THE TESTS WILL BE DETERMINED BY THE ENGINEER AND THE CONTRACTOR SHALL COOPERATE FULLY. FIELD DENSITY DETERMINATIONS SHALL BE PERFORMED IN ACCORDANCE WITH AASHTO T191, T205, OR T214, MODIFIED TO INCLUDE MATERIAL SIZES USED IN THE LABORATORY DETERMINATION OF DENSITY; WITH NUCLEAR FIELD DENSITY TESTING DEVICE; OR BY OTHER APPROVED METHODS. WHEN THE NUCLEAR FIELD DENSITY TESTING DEVICE IS USED, DENSITY DETERMINATIONS FOR THE MATERIAL WILL BE RELATED TO THE DENSITY OF THE SAME MATERIAL TESTED IN ACCORDANCE WITH VTM-1, VTM-10, OR VTM-12 AND A CONTROL STRIP WILL NOT BE REQUIRED. WHEN THE TEST RESULTS INDICATE

THAT THE DENSITY IS LESS THAN THE PERCENT SPECIFIED, THE CONTRACTOR SHALL EXCAVATE AND RE-COMPACT THE AREAS WHICH HAVE FAILED AT NO EXPENSE TO THE OWNER. WHENEVER A TEST FAILS TO MEET THE REQUIRED DENSITY, THE CONTRACTOR SHALL PAY FOR RETESTING THE AREAS AFTER CORRECTIVE ACTION HAS BEEN TAKEN.

1.05 UNDERGROUND UTILITIES

A. THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS ARE APPROXIMATE AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR EXACT LOCATION. EXCAVATION TO CONFIRM ELEVATIONS OF EXISTING SANITARY LINES MAY BE REQUIRED PRIOR TO LAYING NEW SANITARY SEWERS TO CONFIRM DEPTHS OF EXISTING SEWER LINES, PARTICULARLY ON DEAD END LINE SEGMENTS WHERE TERMINAL ELEVATIONS ARE UNKNOWN.

B. LOCATE EXISTING UTILITIES, CULVERTS, AND STRUCTURES, ABOVE OR BELOW GROUND, BEFORE ANY EXCAVATION STARTS. COORDINATE WORK WITH UTILITY COMPANIES. PROTECT, MAINTAIN IN SERVICE, AND PREVENT DAMAGE TO UTILITIES NOT DESIGNATED TO BE REMOVED. WHEN UTILITIES ARE ENCOUNTERED AND ARE NOT SHOWN ON DRAWINGS OR WHEN LOCATIONS DIFFER FROM THOSE SHOWN ON DRAWINGS, NOTIFY THE OWNER FOR INSTRUCTIONS BEFORE PROCEEDING. THE CONTRACTOR SHALL REPAIR AT HIS OWN EXPENSE ANY DAMAGE TO EXISTING UTILITIES, INCLUDING SERVICE CONNECTIONS.

1.06 EXCAVATION SHALL BE CLASSIFIED AS COMMON OR ROCK ACCORDING TO THE FOLLOWING.

A. COMMON EXCAVATION CONSISTS OF EXCAVATION OF ALL OTHER MATERIALS ENCOUNTERED NOT CLASSIFIED AS ROCK EXCAVATION OR UNAUTHORIZED EXCAVATION.

B. ROCK EXCAVATION CONSISTS OF ALL SOLID ROCK THAT CANNOT BE EXCAVATED WITHOUT CONTINUOUS AND SYSTEMATIC DRILLING AND BLASTING OR CONTINUOUS USE OF ROCK EXCAVATION EQUIPMENT. BOULDERS 1 CUBIC YARD OR MORE IN VOLUME, SOLID ROCK, ROCK IN LEDGES, AND ROCK HARD CEMENTITIOUS AGGREGATE DEPOSITS ARE TYPICAL OF THIS MATERIAL.

C. ROCK EXCAVATION SHALL NOT BE PERFORMED UNTIL THE OWNER HAS VERIFIED THAT ROCK EXCAVATION IS REQUIRED AND HAS MEASURED THE QUANTITY OF ROCK EXCAVATION.

D. INTERMITTENT DRILLING OR BLASTING THAT MAY BE PERFORMED MERELY TO INCREASE PRODUCTION WILL BE CLASSIFIED AS COMMON EXCAVATION.

1.07 UNAUTHORIZED EXCAVATION CONSISTS OF REMOVAL OF MATERIALS BEYOND INDICATED SUBGRADE ELEVATIONS OR SIDE DIMENSIONS, WITHOUT SPECIFIC APPROVAL OF THE OWNER. UNAUTHORIZED EXCAVATION SHALL BE REPLACED AT CONTRACTOR'S EXPENSE.

1.08 FOR TRENCHES, THE PAY WIDTH FOR EXCAVATIONS SHALL BE THE ACTUAL WIDTH OF EXCAVATION AT GROUND LEVEL OR THE OUTSIDE NOMINAL DIAMETER OF THE PIPE PLUS 24 INCHES, WHICHEVER IS LESS, FOR PIPES 8 INCHES AND LARGER. FOR PIPES 6 INCHES AND SMALLER, THE PAY WIDTH SHALL BE 24 INCHES OR THE ACTUAL WIDTH OF EXCAVATION AT GROUND LEVEL, WHICHEVER IS LESS. WHEN PAY WIDTH IS NOT AN EVEN FOOT OR HALF FOOT, IT SHALL BE INCREASED TO THE NEAREST FOOT OR HALF FOOT. THE CONTRACTOR'S UNIT PRICES SHALL INCLUDE COSTS FOR WORK REQUIRED OUTSIDE THE PAY WIDTH LIMITS DESCRIBED ABOVE TO COVER EXTRA EXCAVATION AND PAVEMENT PATCHING REQUIRED DUE TO METHODS OF CONSTRUCTION, SAFETY, ETC. ALL AREAS DISTURBED OUTSIDE THE PAY WIDTH SHALL BE RESTORED TO ORIGINAL CONDITION OR AS SPECIFIED, AT THE

CONTRACTOR'S EXPENSE, NO ADDITIONAL AREA SHALL BE ADDED TO THE PAY WIDTH DESCRIBED ABOVE TO REIMBURSE THE CONTRACTOR FOR EXCAVATION OR RESTORATION COSTS.

2. PRODUCTS

2.01 CRUSHER RUN AGGREGATE SHALL BE SIZE NO. 25 OR NO. 26 AS DEFINED IN VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 205, "CRUSHER RUN AGGREGATE."

2.02 PIPE BEDDING FILL SHALL MEET REQUIREMENTS FOR COARSE AGGREGATES, ASTM C 33, SIZE NO. 57, 68, 78 OR SMALLER.

2.03 COARSE AGGREGATE FILL SHALL BE SIZE NO. 1 AS DEFINED IN VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 203, "COARSE AGGREGATE."

2.04 AGGREGATE FILL SHALL BE TYPE I, SIZE 21 OR 21A, DENSE GRADED AGGREGATE BASE MATERIAL AS DEFINED IN VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 208, "SUBBASE AND AGGREGATE BASE MATERIAL."

2.05 CLEAN EARTH FILL SHALL BE FREE OF DEBRIS, ROOTS, FROZEN MATERIALS, ORGANIC MATTER, ROCK OR GRAVEL LARGER THAN 1-INCH IN ANY DIMENSION, OR OTHER HARMFUL MATTER.

2.06 EARTH FILL SHALL BE FREE OF DEBRIS, ROOTS, FROZEN MATERIALS, ORGANIC MATTER, ROCK LARGER THAN 5 INCHES IN ANY DIMENSION, OR OTHER HARMFUL MATTER.

2.07 SELECT BORROW SHALL CONSIST OF APPROVED MATERIAL REQUIRED FOR THE CONSTRUCTION OF EMBANKMENTS FOR THE ADDITION OF TOPSOIL LAYERS OR FOR OTHER PORTIONS OF THE WORK AND SHALL BE OBTAINED FROM AN APPROVED OFF SITE SOURCE. UNLESS OTHERWISE SPECIFICALLY DESIGNATED ON THE DRAWINGS OR AUTHORIZED BY THE ENGINEER, THE CONTRACTOR SHALL MAKE HIS OWN ARRANGEMENTS FOR OBTAINING BORROW AND PAY ALL COSTS INVOLVED.

2.08 CLASS I RIPRAP SHALL BE VDOT DRY RIPRAP, CLASS I, AND CONSIST OF STONES OR BLOCKS WEIGHING BETWEEN 50 AND 150 POUNDS EACH, WITH ENOUGH SMALL PIECES TO FILL IN THE VOID SPACES BETWEEN THE LARGER STONES.

2.09 CLASS II RIPRAP SHALL BE VDOT DRY RIPRAP, CLASS II, AND CONSIST OF STONES OR BLOCKS WEIGHING BETWEEN 150 AND 500 POUNDS EACH, WITH ENOUGH SMALL PIECES TO FILL IN THE VOID SPACES BETWEEN THE LARGER STONES.

2.10 GEOTEXTILE FABRIC

A. GEOTEXTILE FABRIC SHALL BE PROTECTED FROM MUD, DIRT, DUST, SUNLIGHT, AND DEBRIS DURING TRANSPORT AND STORAGE. MATERIAL SHALL BE INERT TO COMMONLY ENCOUNTERED CHEMICALS; RESISTANT TO MILDEW, ROT, INSECTS, AND RODENTS; AND BIOLOGICALLY AND THERMALLY STABLE. GEOTEXTILE FABRIC FOR SUBSURFACE INSTALLATION SHALL NOT BE EXPOSED TO DIRECT SUNLIGHT FOR MORE THAN 24 HOURS DURING INSTALLATION.

B. TENSILE STRENGTH REQUIREMENTS SHALL BE IN THE MACHINE AND CROSS-MACHINE DIRECTIONS.

(1) GEOTEXTILE FABRIC FOR USE IN SILT FENCES, SILT BARRIERS, OR FILTER BARRIERS: FABRIC SHALL CONTAIN ULTRAVIOLET INHIBITORS AND STABILIZERS TO PROVIDE AT LEAST 6 MONTHS OF EXPECTED, USABLE CONSTRUCTION LIFE AT A TEMPERATURE RANGE OF 0 DEGREE F TO 120 DEGREES F. THE TENSILE STRENGTH OF THE MATERIAL AFTER 6 MONTHS

OF INSTALLATION SHALL BE AT LEAST 50 PERCENT OF THE INITIAL STRENGTH.

a) SILT FENCES:

PHYSICAL PROPERTY	TEST METHOD	REQUIREMENTS (MIN.)
FILTERING EFFICIENCY	VTM 51	75 PERCENT
FLOW RATE	VTM 51	0.2GAL./SQ. FT./MIN.
TENSILE STRENGTH AT 20% (MAX.) ELONGATION	VTM 52	
EXTRA STRENGTH:		MIN.60 LB./LIN. INCH
STANDARD STRENGTH:		MIN.30 LB./LIN. INCH

b) SILT BARRIERS AND FILTER BARRIERS (INLET PROTECTION):

PHYSICAL PROPERTY	TEST METHOD	REQUIREMENTS (MIN.)
FILTERING EFFICIENCY	VTM 51	75 PERCENT
FLOW RATE	VTM 51	0.3GAL./SQ. FT./MIN.
TENSILE STRENGTH AT 20% (MAX.) ELONGATION	VTM 52	MIN.30 LB./LIN. INCH

(2) GEOTEXTILE FOR USE UNDER RIPRAP, (BEDDING MATERIAL):

PHYSICAL PROPERTY	TEST METHOD	REQUIREMENTS (MIN.)
APPARENT OPENING SIZE	ASTM D 4751	EQUAL TO OR GREATER THAN NO. 50 SIEVE
TENSILE STRENGTH AT 20% (MAX.) ELONGATION INCH	VTM 52	MIN. 30 LB./LIN.
PUNCTURE STRENGTH	ASTM D 4833	MIN. 80 LB.

SEAMS SHALL BE EQUAL IN STRENGTH TO THE BASIC MATERIAL.

ADDITIONAL FABRIC MATERIAL OR NONCORROSIVE STEEL WIRE MAY BE INCORPORATED INTO FABRIC TO INCREASE OVERALL STRENGTH.

(3) GEOTEXTILE DRAINAGE FABRIC, (FOR UNDERDRAIN CONSTRUCTION):

PHYSICAL PROPERTY	TEST METHOD	REQUIREMENTS (MIN.)
APPARENT OPENING SIZE	ASTM D 4751	EQUAL TO OR GREATER THAN NO. 30 SIEVE
PERMITTIVITY	ASTM 4491	MIN. 0.51 SEC.[1]
TENSILE STRENGTH AT 20% (MAX.) ELONGATION	VTM 52	MIN. 25 LB./LIN. INCH

(4) SOIL RETENTION COVERINGS: (VDOT EC-2)

JUTE MESH	OPENING SIZE	0.60 IN. LENGTHWISE 0.90 IN. CROSSWISE
	WEIGHT	0.90 LBS/SQ. YARD
EXCELSIOR MAT	FIBER LENGTH ABSORBENCY	80% OVER 6 IN. LONG 8 TIMES FIBER WEIGHT
COIR FIBER MAT	COIR FIBER REINFORCEMENT	0.5 LBS/SQ.YD. POLYPROPYLENE MESH

(5) TURF REINFORCEMENT MAT: (TRM)

a) SLOPE STABILIZATION UP TO 6 FEET IN HEIGHT:

ULTIMATE TENSILE STRENGTH	ASTM D4595	200 LBS./LIN. INCH
APPARENT OPENING SIZE	ASTM D4751	EQUAL OR SMALLER THAN 0.85 MM
SECANT MODULUS INCH @10% STRAIN	ASTM D4595	1,700 LBS./LIN.
SOIL FABRIC FRICTION ANGLE (OTTAWA SAND)	ASTM D5321	24 DEG. (MIN)
TEAR STRENGTH	ASTM D4533	75 LBS. (MIN)
PUNCTURE STRENGTH	ASTM D4833	75 LBS. (MIN)

b) TURF REINFORCING MAT FOR CHANNEL LINING SHALL BE NORTH AMERICAN GREEN C125 OR APPROVED EQUAL, UNLESS SPECIFICALLY NOTED OTHERWISE ON PROJECT PLANS.

c) RODENT DETERRENT TURF REINFORCING MAT SHALL BE NORTH AMERICAN GREEN P300 OR APPROVED EQUAL INCORPORATING POLYPROPYLENE FIBERS TO RESIST RODENT DAMAGE.

2.11 FLOWABLE FILL SHALL BE A PORTLAND CEMENT AND SAND MIXTURE LIQUID ENOUGH TO FLOW INTO AREA BEING STABILIZED, SELF LEVELING AND HAVE AN MINIMUM 28 DAY FULLY CURED STRENGTH OF 225 POUNDS PER SQUARE INCH.

2.12 METALLIC LOCATING TAPE SHALL BE ACID AND ALKALI RESISTANT POLYETHYLENE FILM TAPE, SIX INCHES WIDE AND 4 MILS THICK, CONTINUOUSLY INSCRIBED WITH A DESCRIPTION OF THE UTILITY, WITH METALLIC CORE ENCASED IN A PROTECTIVE JACKET FOR CORROSION PROTECTION, DETECTABLE BY METAL DETECTOR WHEN TAP IS BURIED UP TO 30 INCHES DEEP, TAPE FOR MARKING WATER LINES SHALL BE BLUE, TAPE FOR MARKING SEWER SYSTEMS SHALL BE GREEN.

3. EXECUTION

3.01 STRIP EXISTING TOPSOIL, LEAF MOLD, AND ORGANIC MATERIALS MEETING TOPSOIL REQUIREMENTS OF SECTION 02930 - SEEDING. DEPOSIT IN STORAGE PILES SEPARATE FROM OTHER EXCAVATED MATERIAL FOR REUSE DURING SITE RESTORATION. IN DEVELOPED AREAS, TOPSOIL SHALL BE STOCKPILED ON LOCATION AT EACH PROPERTY TO ENSURE IT IS REINSTATED TO ORIGINAL LOCATION.

3.02 WHEN CHANGES ARE AUTHORIZED FROM THE ELEVATIONS AND DIMENSIONS SHOWN ON THE DRAWINGS RESULTING IN MORE EXCAVATION THAN ORIGINALLY INDICATED, THE CONTRACTOR SHALL BE PAID FOR THE ADDITIONAL VOLUME OF EXCAVATION. WHEN AUTHORIZED CHANGES RESULT IN A DECREASED VOLUME, THE CONTRACTOR SHALL ALLOW A CREDIT FOR THE OMITTED VOLUME. THE EXTRA OR CREDIT SHALL BE BASED UPON UNIT PRICES IN THE BID FORM FOR COMMON, EXTRA DEPTH OR ROCK EXCAVATION AS APPROPRIATE.

3.03 WHERE UNAUTHORIZED EXCAVATIONS HAVE BEEN CARRIED BEYOND POINTS REQUIRED, RESTORE THESE AREAS TO THE ELEVATIONS AND DIMENSIONS SHOWN ON THE DRAWINGS WITH MATERIAL APPROVED BY THE ENGINEER, COMPACT AND RESTORE AS SPECIFIED AT CONTRACTOR'S EXPENSE.

3.04 WHERE SOFT, YIELDING, OR OTHERWISE UNSATISFACTORY MATERIAL IS ENCOUNTERED IN THE TRENCH BOTTOM, THE CONTRACTOR SHALL REMOVE THE MATERIAL TO SUCH DEPTH AS DETERMINED BY THE ENGINEER AND REPLACE WITH #57/#67 COARSE AGGREGATE FILL. REMOVAL OF UNSATISFACTORY MATERIAL FROM THE TRENCH BOTTOM WILL BE PAID AS COMMON EXCAVATION FOR TRENCH DEPTHS LESS THAN 8 FEET, EXTRA DEPTH TRENCH EXCAVATION FROM 8 TO 16 FEET FOR TRENCHES FROM 8 TO 16 FEET DEEP, OR EXTRA DEPTH TRENCH EXCAVATION GREATER THAN 16 FEET DEEP FOR TRENCHES GREATER THAN 16 FEET DEEP. EXTRA AGGREGATE FILL REQUIRED TO REPLACE UNSATISFACTORY MATERIAL WILL BE PAID AS COARSE AGGREGATE FILL, (#57/#67 AGGREGATE).

3.05 WHERE REMOVAL OF UNSATISFACTORY MATERIAL IS DUE TO FAULT OR NEGLIGENCE OF THE CONTRACTOR, BY INADEQUATE SHORING OR BRACING, DEWATERING, MATERIAL STORAGE, OR OTHER FAILURE TO MEET SPECIFIED REQUIREMENTS, WORK SHALL BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER.

3.06 EXCAVATION

A. CRUSHER RUN AGGREGATE, OR ASPHALT MILLINGS SHALL BE SPREAD ON PAVEMENT BEFORE STOCKPILING EXCAVATED MATERIAL ON THE PAVEMENT. THE CRUSHER RUN AGGREGATE SHALL BE CONSIDERED INCIDENTAL TO THE INSTALLATION OF THE VARIOUS UTILITIES, SIDEWALKS, CURB AND GUTTER, DRIVEWAY ENTRANCES, ETC., AND WILL NOT BE MEASURED FOR SEPARATE PAYMENT.

B. EXCAVATE TRENCHES BELOW BOTTOM OF PIPE FOR PIPE BEDDING FILL IN ACCORDANCE WITH STANDARD DETAILS 26.01 AND 27.01. IN EXCAVATING FOR THE TRENCH, IT IS ESSENTIAL THAT THE TRENCH BOTTOM BE UNIFORM IN GRADE AND REMAINS STATIC DURING BACKFILLING AND UNDER ALL SUBSEQUENT TRENCH CONDITIONS. THE GRADE OF THE BOTTOM OF THE TRENCH SHALL BE GRADED TO WITHIN 0.04 FOOT (1/2-INCH) OF THE PLAN SPECIFIED GRADE. THE STONE SHALL BE GRADED TO THE SAME TOLERANCE.

C. PAVEMENT, CURB, GUTTER, AND SIDEWALK MATERIAL EXCAVATED ALONG THE TRENCH SHALL NOT BE USED AS BACKFILL MATERIAL.

D. ROCK THAT HAS BEEN REMOVED FROM THE TRENCH BY BLASTING OR WITH ROCK EXCAVATION EQUIPMENT SHALL NOT BE USED AS BACKFILL MATERIAL, PROPERLY SIZED BLAST ROCK, MEETING VDOT STANDARDS FOR CLASS I OR CLASS II RIPRAP MAY BE USED ON THE PROJECT AS AUTHORIZED BY THE ENGINEER, PAYMENT FOR PROPERLY SIZED AND PLACED BLAST ROCK USED AS RIPRAP WILL BE IN ACCORDANCE WITH CONTRACT UNIT PRICES FOR THESE ITEMS, PROVIDED ALL VDOT STANDARDS AND CONTRACT INSTALLATION REQUIREMENTS ARE FOLLOWED.

E. KEEP EXCAVATIONS FREE OF WATER WHILE WORK IS BEING PERFORMED. DO NOT ALLOW WATER TO ACCUMULATE IN EXCAVATIONS. DO NOT USE EXCAVATED TRENCHES AS TEMPORARY DRAINAGE DITCHES. REROUTE SURFACE WATER RUNOFF AWAY FROM OR AROUND EXCAVATED AREAS.

F. WHERE UNDERGROUND STREAMS OR SPRINGS ARE FOUND, PROVIDE TEMPORARY DRAINAGE AND NOTIFY THE ENGINEER.

G. REMOVE FROM PROJECT SITE AND DISPOSE OF MATERIAL UNSATISFACTORY FOR REUSE, INCLUDING ALL TRASH AND EXCESS MATERIAL, WHICH CANNOT BE REUSED CONTINUOUSLY WITH THE PROGRESS OF THE WORK. KEEP ALL PAVEMENTS AND AREA ADJACENT TO WORK CLEAN AND FREE FROM MUD, DIRT AND DEBRIS AT ALL TIMES. DISPOSE OF ALL UNSATISFACTORY MATERIAL TO A SITE WHICH LEGALLY CAN ACCEPT SUCH MATERIAL AS FILL. ADHERE TO ALL APPLICABLE LAWS AND ORDINANCES REGARDING PERMITTING OF WASTE OR FILL SITES, EROSION CONTROL, ZONING, ETC. AS MAY BE APPLICABLE.

H. REMOVE SHORING AND ALL FORM MATERIALS.

I. WHERE ROCK IS ENCOUNTERED SO THAT A MANHOLE, VAULT, OR OTHER STRUCTURE WILL BEAR ON ROCK, THE ROCK SHALL BE REMOVED TO A DEPTH OF 12 INCHES BELOW THE FOUNDATION OR FOOTING AND 12 INCHES OF COMPACTED COARSE AGGREGATE SHALL BE PLACED BETWEEN THE STRUCTURE AND ROCK. WHERE ONLY A PART OF THE FOUNDATION WILL BEAR ON ROCK, THE ROCK SHALL BE REMOVED TO A DEPTH OF 12 INCHES BELOW THE STRUCTURE FOOTING OR FOUNDATION AND 12 INCHES OF COMPACTED COARSE AGGREGATE SHALL BE PLACED BETWEEN THE STRUCTURE AND ROCK.

J. IN AREAS WHERE TRENCHING FOR PIPES WILL BE IN FILLS, THE FILLS SHALL BE BROUGHT TO AN ELEVATION OF AT LEAST 12 INCHES ABOVE THE TOP OF THE PIPE, AND THEN THE TRENCH EXCAVATED IN THE COMPACTED FILL, AS HEREIN SPECIFIED FOR TRENCH EXCAVATION.

3.07 PIPE BEDDING

A. BEDDING FOR PIPE SHALL BE COARSE AGGREGATE FILL, #57 OR #67 STONE.

B. PLACE REQUIRED PIPE BEDDING FILL IN ACCORDANCE WITH STANDARD DETAILS. BEDDING TO BE PLACED TO CROWN OF ALL PVC PIPING. IF THE TRENCH SUBGRADE IS FOUND TO BE SOFT, SPONGY, EXCESSIVELY WET, UNSTABLE OR IN ANY OTHER WAY UNFIT SUCH THAT THERE IS INADEQUATE PIPE SUPPORT, THE MATERIAL SHALL BE REMOVED FOR THE FULL WIDTH OF THE TRENCH, AND THE EXCAVATED AREA SHALL BE STRENGTHENED FOR FOUNDATION PURPOSES BY FURNISHING AND PLACING EITHER APPROVED COARSE AGGREGATE, CONCRETE CRADLE, CONCRETE SOIL STABILIZATION, CONCRETE ENCASEMENT, PIERS, OR A COMBINATION OF THESE MATERIALS AS DIRECTED BY THE ENGINEER. IF UNSUITABLE BEDDING CONDITIONS ARE THE RESULT OF FAULT, NEGLIGENCE OR POOR CONSTRUCTION METHODS, THESE IMPROVEMENTS SHALL BE CONDUCTED AT NO ADDITIONAL COST TO THE OWNER.

C. COMPACT PIPE BEDDING BY TAMPING OR RODDING TO PREVENT SETTLEMENT.

D. EXCAVATE BELL HOLES IN THE BEDDING TO INSURE THAT THE PIPE BARREL IS FULLY SUPPORTED BY THE BEDDING.

E. WHEN ROCK IS ENCOUNTERED IN TRENCH BOTTOM IT SHALL BE REMOVED TO A DEPTH OF 6 INCHES BELOW PIPE AND 6 INCHES OF COARSE AGGREGATE FILL SHALL BE PLACED BETWEEN THE BETWEEN THE PIPE AND TRENCH BOTTOM.

F. PROVIDE A MINIMUM OF 12 INCHES OF COMPACTED COARSE AGGREGATE BEDDING FOR ALL STRUCTURES, SHAPED TO PROVIDE UNIFORM SUPPORT ACROSS THE ENTIRE BASE OF THE STRUCTURE.

3.08 COMPACTION

A. COMPACT EACH LAYER OF FILL OR BACKFILL TO NOT LESS THAN THE FOLLOWING PERCENTAGES OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D 698 (AASHTO T-99).

(1) 100 PERCENT BENEATH AND WITHIN 25 FEET OF BUILDINGS STRUCTURES, AND DRAINAGE APPURTENANCES, INCLUDING THOSE SHOWN FOR FUTURE CONSTRUCTION

(2) 95 PERCENT BENEATH PAVEMENTS, WALKS, AND ROAD SHOULDERS, INCLUDING THOSE SHOWN FOR FUTURE CONSTRUCTION

(3) 90 PERCENT IN OTHER UNPAVED AREAS

B. COMPACT SOIL MATERIALS USING EQUIPMENT SUITABLE FOR MATERIALS TO BE COMPACTED AND WORK AREA LOCATIONS. BACKFILL MATERIALS ARE TO BE MAINTAINED WITHIN +/- 20 PERCENT OF OPTIMUM MOISTURE CONTENT WHEN BACKFILLING. USE POWER-DRIVEN HAND TAMPERS FOR COMPACTING MATERIALS ADJACENT TO STRUCTURES. TRENCH BACKFILL SHALL BE COMPACTED IN LIFTS TO ACHIEVE UNIFORM DENSITY, UNCOMPACTED LIFTS SHALL NOT EXCEED 12 INCHES IN HEIGHT, UNDER PAVEMENT AND STRUCTURES UNCOMPACTED LIFTS SHALL NOT EXCEED 8 INCHES. MOISTURE CONTENT SHALL BE MONITORED DURING CONSTRUCTION TO ENSURE MAINTENANCE OF OPTIMUM MOISTURE LEVELS.

3.09 BACKFILL

A. OBTAIN THE PARTICULAR BACKFILL MATERIAL REQUIRED FROM EXCAVATION STOCKPILES, BORROW AREAS, OR OTHER APPROVED SOURCES AT CONTRACTOR EXPENSE. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SUITABLE BACKFILL FOR ALL AREAS OF EXCAVATION. THE COST OF THIS MATERIAL SHALL BE PART OF THE UNIT PRICE BID ITEMS. SELECT BORROW WILL ONLY BE USED AS SPECIFICALLY CALLED FOR ON PLANS, AS DIRECTED BY THE ENGINEER, OR AS OUTLINED IN THIS MANUAL.

B. BACKFILL TRENCH TO A COMPACTED DEPTH OF 1 FOOT OVER THE PIPE WITH CLEAN EARTH FILL. BACKFILL SHALL BE PLACED BY HAND UNIFORMLY ON EACH SIDE OF THE PIPE AND COMPACTED IN LAYERS NOT EXCEEDING 6 INCHES. DO NOT BACKFILL ON MUDDY OR FROZEN SOIL, OR WITH MUDDY OR FROZEN SOIL.

C. BACKFILL TRENCH FROM 1 FOOT ABOVE THE PIPE TO GRADE WITH EARTH FILL FREE OF STONES OR OTHER MATERIAL LARGER THAN 5 INCHES OR 1/2 THE LAYER THICKNESS IN ANY DIMENSION, WHICHEVER IS SMALLER. LAYERS SHALL NOT EXCEED 12 INCHES, EXCEPT THAT UNDER ROAD SHOULDERS AND UNDER EXISTING OR FUTURE PAVED AREAS AND STRUCTURES, LAYERS SHALL NOT EXCEED 6 INCHES. BACKFILL SHALL BE COMPACTED TO THE DENSITY SPECIFIED FOR THE AREAS IN WHICH IT IS LOCATED EXCEPT THAT MINIMUM COMPACTION IN ANY AREA SHALL BE TO THE DENSITY OF THE ADJACENT SOIL.

D. EXCAVATE DEPRESSIONS CAUSED BY REMOVAL OF STUMPS OR OTHER CLEARING OPERATIONS TO FIRM SUBGRADE, FILL WITH CLEAN EARTH FILL, AND COMPACT AS SPECIFIED.

E. PLACE BACKFILL MATERIALS EVENLY ADJACENT TO STRUCTURES. TAKE CARE TO PREVENT WEDGING ACTION OF THE BACKFILL AGAINST STRUCTURES BY CARRYING THE MATERIAL UNIFORMLY AROUND THE STRUCTURE TO APPROXIMATELY THE SAME ELEVATION IN EACH LIFT. REMOVE SHEETING AND SHORING GRADUALLY AS THE TRENCH IS FILLED TAKING PRECAUTIONS TO PREVENT SIDES OF TRENCH FROM SLIDING INTO THE TRENCH ONTO OR AGAINST THE PIPE.

F. COMPACT EACH LAYER OF BACKFILL TO THE REQUIRED DENSITY.

G. REPLACE TOPSOIL AND/OR PROVIDE NEW TOPSOIL TO AT LEAST 6 INCHES OR THE ORIGINAL DEPTH WHICHEVER IS GREATER IN AREAS TO BE SEEDED. PROVISION OF ADDITIONAL TOPSOIL TO ENABLE INSTALLATION OF 6-INCH LAYER WILL BE PAID FOR AS SELECT BORROW. THE DEPTH OF TOPSOIL EXISTING PRIOR TO EXCAVATION AS DETERMINED FROM SOIL HORIZON MEASUREMENTS IN THE TRENCH WALL SHALL BE DEDUCTED FROM THIS VOLUME IF ORIGINAL SOIL IS NOT REUSED. PROVISION OF NEW TOPSOIL TO REPLACE EXISTING MATERIAL WASTED BY THE CONTRACTOR SHALL BE AT CONTRACTOR EXPENSE. TOPSOIL SHALL BE FREE OF ROCKS AND RAKED TO A SMOOTH UNIFORM SURFACE.

H. AGGREGATE FILL PLACED UNDER MANHOLES, INLETS OR OTHER STRUCTURES SHALL BE COMPACTED WITH TWO PASSES OF VIBRATORY PLATE OR VIBRATORY ROLLER.

I. LOCATING TAPE SHALL BE INSTALLED OVER ALL NON-METALLIC MAINS AND SERVICE LATERALS AND SHALL BE LOCATED NO MORE THAN 12 INCHES BELOW FINAL GRADE.

J. FLOWABLE FILL SHALL BE USED AS SPECIFIED ON PROJECT PLANS OR AS DIRECTED BY THE ENGINEER, FLOWABLE FILL SHALL BE ALLOWED TO CURE FOR A MINIMUM OF TWO HOURS PRIOR TO CONTINUING BACKFILL OPERATIONS. FINAL GRADING OVER FLOWABLE FILL SHALL BE DELAYED BY AT LEAST 24 HOURS TO ALLOW FOR SHRINKAGE AND CONCRETE HYDRATION.

K. REUSABLE MATERIALS INCLUDE PAVING BLOCKS, BELGIUM BLOCKS, BLUESTONE, BRICK, CASTINGS, PIPE, ETC. THAT ARE REMOVED DURING EXCAVATION AND MAY BE REUSABLE ON THIS PROJECT OR FUTURE PROJECTS AS DETERMINED BY THE ENGINEER SHALL BE PRESERVED AT NO ADDITIONAL COST TO THE CITY. UNNECESSARY ABUSE AND DAMAGE TO THESE ITEMS SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND THE COST OF REPLACEMENT MAY BE DEDUCTED FROM THE RETAINAGE AT THE ENGINEERS DIRECTION.

3.10 GRADING

A. UNIFORMLY GRADE ALL AREAS WITHIN THE LIMITS DESIGNATED ON THE DRAWINGS, INCLUDING ADJACENT TRANSITION AREAS. FINISH SURFACES WITHIN SPECIFIED TOLERANCES WITH UNIFORM LEVELS OR SLOPES BETWEEN POINTS WHERE ELEVATIONS ARE SHOWN AND EXISTING GRADES.

B. FINISH ALL SURFACES FREE FROM IRREGULAR CHANGES, ROCKS, OR DEBRIS.

C. FINISH SUBGRADE AREAS TO RECEIVE TOPSOIL TO WITHIN 0.10 FOOT OF REQUIRED SUBGRADE ELEVATIONS.

D. SHAPE SUBGRADE UNDER WALKS TO LINE, GRADE, AND CROSS-SECTION TO WITHIN 0.10 FOOT OF REQUIRED SUBGRADE ELEVATIONS.

E. SHAPE SUBGRADE UNDER PAVEMENT TO LINE, GRADE, AND CROSS-SECTION TO WITHIN 1/2-INCH OF REQUIRED SUBGRADE ELEVATIONS.

F. PROTECT NEWLY GRADED AREAS FROM TRAFFIC AND EROSION. REPAIR AND REESTABLISH GRADE IN SETTLED, ERODED, OR RUTTED AREAS TO THE SPECIFIED TOLERANCES. IF THE CONTRACTOR SHALL FAIL TO MAINTAIN ANY TRENCH WITHIN 2 DAYS AFTER RECEIPT OF WRITTEN NOTICE FROM THE ENGINEER, THE ENGINEER MAY REFILL DEPRESSIONS AND THE COST OF SUCH WORK MAY BE RETAINED FROM MONIES DUE THE CONTRACTOR OR BILLED DIRECTLY TO THE CONTRACTOR. IN CASE OF EMERGENCY, THE OWNER MAY REFILL ANY DANGEROUS DEPRESSIONS WITHOUT PRIOR NOTICE TO THE CONTRACTOR.

G. WHERE COMPACTED AREAS ARE DISTURBED BY SUBSEQUENT CONSTRUCTION OR ADVERSE WEATHER, SCARIFY THE SURFACE, RESHAPE, AND COMPACT TO THE REQUIRED DENSITY. USE HAND TAMPER FOR RECOMPACTION OVER UNDERGROUND UTILITIES.

3.11 UTILITIES TO BE ABANDONED OR REMOVED

A. WHEN UNDERGROUND UTILITIES ARE TO BE ABANDONED IN PLACE, PLUG, CAP, OR SEAL WITH CONCRETE AT THE "CONSTRUCTION LIMITS" OR AT POINTS SHOWN AND GROUT UP THE REMAINING LINE SEGMENT WITH FLOWABLE FILL.

B. REMOVE UNDERGROUND UTILITIES INDICATED ON THE DRAWINGS TO BE REMOVED, AND BACKFILL RESULTING EXCAVATION WITH SUITABLE MATERIAL COMPACTED AS SPECIFIED. PLUG, CAP, OR SEAL UTILITIES WITH CONCRETE AT THE CONSTRUCTION LIMITS OR AT POINTS SHOWN.

C. THE COST OF REMOVING EXISTING MANHOLES AND PIPE TO ALLOW THE INSTALLATION OF NEW UTILITIES SHALL BE INCLUDED IN THE CONTRACTOR'S UNIT PRICES FOR UTILITY PIPE INSTALLATION.

3.12 EROSION CONTROL

A. NO MORE THAN 300 FEET OF TRENCH SHALL BE OPEN AT ANY ONE TIME.

B. NO DISTURBED AREA SHALL BE DENUDED FOR MORE THAN 7 CALENDAR DAYS.

C. PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN 7 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE LINE. SOIL STABILIZATION SHALL ALSO BE APPLIED WITHIN 7 DAYS TO DENUDED AREAS, WHICH MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT (UNDISTURBED) FOR LONGER THAN 15 DAYS. SOIL STABILIZATION PRACTICES INCLUDE VEGETATIVE ESTABLISHMENT, MULCHING, AND EARLY APPLICATION OF GRAVEL BASE ON AREAS TO BE PAVED.

D. COMPLY WITH ALL LOCAL REQUIREMENTS AND WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS AS ADMINISTERED BY THE VIRGINIA SOIL AND WATER CONSERVATION BOARD TO CONTROL EROSION AND SEDIMENTATION.

E. INSTALL SILT FENCES AROUND SOIL STOCKPILES AND EXCAVATIONS.

F. ALL APPLICABLE EROSION AND SILTATION CONTROL MEASURES SHALL BE TAKEN PRIOR TO GRADING.

G. PROTECT AND MAINTAIN STORM SEWER INLETS WITH SILT TRAPS.

H. INSPECT ALL EROSION AND SEDIMENT CONTROL DEVICES AT THE CLOSE OF EACH WORK DAY AND AFTER EACH RAINSTORM. MAKE NECESSARY REPAIRS OR CLEAN UP IMMEDIATELY TO MAINTAIN THE EFFECTIVENESS OF THE DEVICE.

I. WHERE CONSISTENT WITH JOB SAFETY REQUIREMENTS, EASEMENT CONDITIONS, AND CONSTRUCTION METHODS, PLACE ALL EXCAVATED MATERIAL ON THE UPHILL SIDE OF THE TRENCH. WHEN THE SOIL IS PLACED ON THE DOWNHILL SIDE OF THE TRENCH, DIVERT MAXIMUM DRAINAGE TOWARD THE TRENCH.

J. WATER DISCHARGED FROM DEWATERING ACTIVITIES SHALL NOT BE DISCHARGED DIRECTLY TO ANY STREAM OR WATER BODY. COMPLY WITH STATE MINIMUM STANDARD AND SPECIFICATION 3.26, DEWATERING STRUCTURE, OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, 1992 EDITION. WHEN WORKING ADJACENT TO OR WITHIN A WATER BODY, COMPLY WITH STATE MINIMUM STANDARD AND SPECIFICATION 3.27, TURBIDITY CURTAIN, OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, 1992 EDITION.

K. COMPLY WITH PRACTICES OUTLINED IN THE PROJECT STORMWATER POLLUTION PREVENTION PLAN PREPARED IN ACCORDANCE WITH VPDES PERMIT REQUIREMENTS.

3.13 RIPRAP SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 414 "RIPRAP" OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS. GEOTEXTILE FABRIC SHALL BE PLACED UNDER ALL RIPRAP. THE COST FOR SHAPING SUBGRADE FOR RIPRAP PLACEMENT IS INCLUDED IN THE UNIT COST OF RIPRAP, SHAPING ADJACENT AREAS WILL BE PAID FOR AS COMMON EXCAVATION IF OVER TWO INCHES OF ADJUSTMENT IS REQUIRED, OTHERWISE IT WILL BE PAID FOR AS SEEDING AND FINE GRADING.

3.14 PROTECT GRADED AREAS FROM THE ACTION OF THE ELEMENTS. SETTLEMENT OR OTHER DAMAGE THAT OCCURS PRIOR TO ACCEPTANCE OF THE WORK SHALL BE REPAIRED AND GRADES SATISFACTORILY REESTABLISHED.

3.15 REPAIR AFTER CLEANUP. UPON COMPLETION OF CONSTRUCTION WORK AND AFTER SPOILS AND DEBRIS HAVE BEEN REMOVED, REGRADE ANY AREAS DISTURBED BY THE OPERATIONS. REMOVE ALL TEMPORARY EROSION CONTROLS UPON FINAL STABILIZATION AS DIRECTED BY THE ENGINEER.

3.16 BLASTING

A. THE CONTRACTOR SHALL PROVIDE A BLAST WARNING SIGNAL SYSTEM. THE BLAST WARNING SIGNAL SYSTEM SHALL CONSIST OF ONE OR MORE AIR HORNS LOCATED AT THE BLAST SITE. THE AIR HORN(S) SHALL BE AUDIBLE A MINIMUM OF 1 MILE FROM THE BLAST SITE. THE SIGNALS SHALL BE ONE LONG HORN 5 MINUTES PRIOR TO THE BLAST, ONE SHORT HORN 1 MINUTE PRIOR TO THE BLAST, AND ONE LONG HORN AFTER THE BLAST TO SIGNAL ALL CLEAR. THE CONTRACTOR SHALL ERECT TWO CLEAR AND LEGIBLE BLAST WARNING SIGNAL SIGNS AT LOCATIONS DETERMINED BY THE ENGINEER. THE SIGNS SHALL LIST THE BLAST WARNING SIGNAL SYSTEM, THE CONTRACTOR SUPERINTENDENT'S NAME AND TELEPHONE NUMBER, AND THE ENGINEER INSPECTOR'S NAME AND TELEPHONE NUMBER.

B. THE CONTRACTOR SHALL EXCAVATE TEST PITS AT UP TO TWO REPRESENTATIVE LOCATIONS ALONG UTILITY ALIGNMENTS AND UP TO THREE LOCATIONS ADJACENT TO RAILROAD RIGHT-OF-WAYS TO DETERMINE IF THE ROCK IS "RIPPABLE" WITH A CATERPILLAR TRACKHOE 225 OR EQUIVALENT AND THE FEASIBILITY OF ROCK EXCAVATION BY "HOE RAMMING." IF THESE PROCEDURES DO NOT OFFER REASONABLE PRODUCTION FOR ROCK EXCAVATION, THEN BLASTING WILL BE ALLOWED UNLESS OTHERWISE INDICATED. REASONABLE

PRODUCTION FOR ROCK EXCAVATION BY "HOE RAMMING" WILL BE DEFINED AS 5 OR MORE CUBIC YARDS PER HOUR.

C. BLASTING SHALL BE PERFORMED BY A QUALIFIED CONTRACTOR. QUALIFICATIONS, PROPOSED PROCEDURES, AND SCHEDULE SHALL BE SUBMITTED FOR APPROVAL AT LEAST 2 WEEKS PRIOR TO COMMENCING ANY BLASTING OPERATIONS.

D. THE CONTRACTOR SHALL NOTIFY IN WRITING ALL PROPERTY OWNERS WITHIN 250 FEET OF THE PROPOSED BLAST AT LEAST 1 WEEK PRIOR TO THE PROPOSED BLAST AND VERBALLY ON THE DAY OF THE SCHEDULED BLAST. THE CONTRACTOR SHALL NOTIFY THE ENGINEER, LYNCHBURG FIRE MARSHALL AND EMERGENCY OPERATIONS CENTER 48 HOURS PRIOR TO ANY PLANNED BLASTING.

E. BLASTING SHALL BE LIMITED TO MID-MORNING HOURS ON DAYS OF CLEAR-TO-PARTLY CLOUDY SKIES WITH INCREASING SURFACE TEMPERATURE AND LIGHT WIND. BLASTING WILL NOT BE ALLOWED AFTER 3:30 P.M. BLASTING WILL NOT BE ALLOWED ON OVERCAST, LOW CEILING DAYS. THE CONTRACTOR SHALL PROVIDE MONITORING EQUIPMENT TO MONITOR ALL BLASTING. A COPY OF THE MONITOR RECORD SHALL BE GIVEN TO THE OWNER DAILY.

F. THE USE OF UNCONFINED EXPLOSIVES SHALL BE PROHIBITED.

G. THE MAXIMUM ALLOWABLE PEAK PARTICLE VELOCITY SHALL BE 1.25 INCHES PER SECOND FOR ALL STRUCTURES LOCATED 0 TO 300 FEET FROM THE BLASTING SITE, THE MAXIMUM ALLOWABLE PEAK PARTICLE VELOCITY SHALL BE 1.00 INCH PER SECOND FOR ALL STRUCTURES LOCATED 301 TO 5,000 FEET FROM THE BLASTING SITE. THE MAXIMUM ALLOWABLE PEAK PARTICLE VELOCITY SHALL BE 0.75 INCH PER SECOND FOR ALL STRUCTURES LOCATED 5,001 FEET AND BEYOND FROM THE BLASTING SITE.

H. TO MINIMIZE VIBRATION, MINIMUM SCALED DISTANCE (SD) OF 50 SHALL BE USED TO DETERMINE MAXIMUM EXPLOSIVE WEIGHT PER DELAY. A TEST BLAST SHALL BE CONDUCTED TO VERIFY THE SCALED DISTANCE. THE MAXIMUM EXPLOSIVE WEIGHT PER DELAY SHALL NOT EXCEED THE DISTANCE FROM THE BLAST TO THE NEAREST STRUCTURE DIVIDED BY 50 SQUARED. MAXIMUM EXPLOSIVE WEIGHT PER DELAY MAY BE REVISED PENDING OUTCOME OF TEST BLAST. TEST BLAST MONITORING SHALL BE AT THE EXPENSE OF THE OWNER. THE RECOMMENDATIONS INDICATED FOR BLASTING CRITERIA IN NO WAY RELIEVES THE CONTRACTOR OF HIS LIABILITY.

I. THE PEAK OVERPRESSURE OR AIR BLAST SHALL NOT EXCEED 0.015 POUNDS PER SQUARE INCH OR THE MAXIMUM LIMITS SPECIFIED IN THE FOLLOWING TABLE:

AIRBLAST LIMITS

LOWER FREQUENCY OF MEASURING SYSTEM (HZ (PLUS OR MINUS 3 DCB))		MEASUREMENT LEVEL (DCB)
0.1 HZ OR LOWER	FLAT RESPONSE	134 PEAK
2 HZ OR LOWER	FLAT RESPONSE	133 PEAK
6 HZ OR LOWER	FLAT RESPONSE	129 PEAK
C-WEIGHTED	SLOW RESPONSE	105 PEAK

J. PREBLAST MEETINGS MAY BE SCHEDULED BY THE ENGINEER TO DOCUMENT HOLE DEPTHS AND SPACING, CHARGE WEIGHT PER DELAY, SHOT SCHEDULING, AND WEATHER CONDITIONS. THE CONTRACTOR SHALL OBTAIN ACCURATE MEASURED DISTANCES FROM STRUCTURES TO CENTER OF BLAST AREA PRIOR TO

DETERMINING THE SAFE MAXIMUM CHARGE-WEIGHT PER DELAY AND LOADING BLAST HOLES.

K. THE CONTRACTOR SHALL CONDUCT PREBLAST AND POST BLAST SURVEYS IF ROCK REMOVAL BY BLASTING IS REQUIRED. THE CONTRACTOR SHALL OBTAIN WRITTEN PERMISSION FROM ALL AFFECTED PROPERTY OWNERS PRIOR TO CONDUCTING BLAST PREPARATION SURVEYS. PREBLAST AND POST BLAST SURVEYS WILL INCLUDE ALL OCCUPIED AND UNOCCUPIED BUILDINGS WITHIN 250 FEET OF BLASTING AREAS. THE COST FOR ALL BLASTING SURVEYS SHALL BE INCLUDED IN THE CONTRACT UNIT PRICES AND WILL NOT BE PAID FOR SEPARATELY.

L. THE OWNER RESERVES THE RIGHT TO MONITOR PRODUCTION BLASTING. IN THIS EVENT, THE CONTRACTOR SHALL PROVIDE THE ENGINEER AMPLE NOTICE OF SCHEDULED BLASTS TO ALLOW SET-UP OF MONITORING EQUIPMENT.

M. PRIOR TO PIPE LAYING OPERATIONS, THE CONTRACTOR SHALL LEASE FOR THE CITY ONE SEISMOGRAPH AND ACCESSORIES. THE SEISMOGRAPH SHALL BE "MINIMATE PLUS BASE UNIT" AS MANUFACTURED BY INSTANTEL OR AN APPROVED EQUAL. THE SEISMOGRAPH SHALL HAVE 300-EVENT CAPACITY AND FOUR CHANNELS, INTERNAL TRIAXIAL SENSOR, INSTALLATION SPIKES, LINEAR MICROPHONE WITH STAND, BLASTMATE III TO PC CONNECTING CABLE, OPERATOR MANUAL, BLASTWARE III COMPLIANCE MODULE AND OPERATOR MANUAL, AND AC ADAPTOR. ACCESSORIES SHALL BE ONE FASTENING PLATE FOR PRECISE LEVELING REQUIREMENTS INCLUDING CEILING AND WALL INSTALLATIONS; ONE STANDARD TRANSDUCER LEVELING PLATE WITH LEVELING FEET AND INTEGRATED SPIRIT LEVEL WHICH CAN BE USED WITH FLOOR, WALL, AND CEILING INSTALLATIONS; ONE EXTERNAL 12-VOLT DC BATTERY POWER SUPPLY CABLE; AND ONE 110-VOLT AC ADAPTOR. THE SEISMOGRAPH AND ACCESSORIES LEASE WILL NOT BE PAID AS A BID ITEM, BUT SHOULD BE INCLUDED IN THE CONTRACTOR'S UNIT PRICE BIDS FOR "HOE-RAMMING" AND "BLASTING." THE CONTRACTOR SHALL HAVE THE SEISMOGRAPH CALIBRATED QUARTERLY. ANOTHER SEISMOGRAPH SHALL BE PROVIDED DURING THE CALIBRATION PROCESS. THE SEISMOGRAPH IS IN ADDITION TO CONTRACTOR'S MONITORING REQUIREMENTS STATED ABOVE.

END OF SECTION

SECTION 02500 - PAVING AND SURFACING

1. GENERAL

1.01 REFERENCE SPECIFICATIONS WHERE APPLICABLE TO WORK UNDER THIS SECTION ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS.....AASHTO

B. AMERICAN SOCIETY FOR TESTING AND MATERIALS.....ASTM

C. VIRGINIA DEPARTMENT OF TRANSPORTATION.....VDOT

1.02 ESTABLISH AND MAINTAIN REQUIRED LINES AND ELEVATIONS.

1.03 APPLY PRIME, TACK AND SEAL COATS ONLY WHEN AMBIENT TEMPERATURE IS ABOVE 50 DEGREES F AND WHEN TEMPERATURE HAS NOT BEEN BELOW 35 DEGREES F FOR 12 HOURS IMMEDIATELY PRIOR TO APPLICATION. CONSTRUCT ASPHALT CONCRETE SURFACE COURSE ONLY WHEN ATMOSPHERIC TEMPERATURE IS ABOVE 40 DEGREES F AND BASE IS DRY. BASE COURSE MAY BE LAID WHEN TEMPERATURE IS ABOVE 30 DEGREES F AND RISING.

1.04 THE USE OF AGGREGATE FROM BLUE RIDGE STONE CORPORATION, ROCKYDALE (MT. ATHOS) PLANT, LYNCHBURG, VIRGINIA WILL BE RESTRICTED FROM USE IN ASPHALT SURFACE COURSES WHERE THE MOST CURRENT AVERAGE DAILY TRAFFIC COUNT (ADT) EXCEEDS 19,999 VEHICLES PER DAY. THE USE OF AGGREGATE FROM BLUE RIDGE STONE CORPORATION, LAWYERS ROAD PLANT, LYNCHBURG, VIRGINIA WILL BE RESTRICTED FROM USE IN ASPHALT SURFACE COURSES WHERE THE ADT EXCEEDS 14,999 VEHICLES PER DAY.

1.05 CONSTRUCTION AND TESTING SHALL CONFORM TO THESE SPECIFICATIONS AND STANDARD DETAILS. ANY ADDITIONAL CONSTRUCTION AND TESTING NOT COVERED HEREIN SHALL BE PER THE APPLICABLE SECTIONS OF DIVISIONS I, II, III, V, AND VII OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE SPECIFICATIONS, LATEST REVISION AND THE STANDARD DETAILS SHOWN IN THE VDOT ROAD AND BRIDGE STANDARDS, LATEST REVISION.

1.06 THE CONTRACTOR SHALL HAVE A CERTIFIED ASPHALT CONCRETE PAVING TECHNICIAN PRESENT DURING PAVING OPERATIONS TO ENSURE PROPER PLACEMENT, ALIGNMENT, GRADING AND QUALITY OF PAVING OPERATION. THE FINISHED PAVEMENT SHALL BE UNIFORM AND SMOOTH. A 10-FOOT STRAIGHTEDGE WILL BE USED TO TEST THE SURFACE ALIGNMENT, THE SURFACE SHALL NOT VARY MORE THAN 1/4 INCH FROM THIS STRAIGHT EDGE, BASED ON TWO BEARING POINTS ON EITHER END OF THE STRAIGHTEDGE. HUMPS AND DEPRESSIONS EXCEEDING THE SPECIFIED TOLERANCE SHALL BE CORRECTED, OR THE DEFECTIVE WORK SHALL BE REMOVED AND REPLACED WITH NEW MATERIAL AT CONTRACTOR EXPENSE.

2. PRODUCTS

2.01 AGGREGATE BASE COURSE SHALL BE TYPE I, SIZE 21 OR 21A, GRADED AGGREGATE BASE MATERIAL AS DEFINED IN VDOT, ROAD AND BRIDGE SPECIFICATIONS, SECTION 208, "SUBBASE AND AGGREGATE BASE MATERIAL."

2.02 MATERIALS FOR USE WITH ASPHALT CONCRETE AS SPECIFIED AS FOLLOWS:

A. PRIME COAT SHALL BE CUT-BACK ASPHALT RC-70 OR RC-250, MEETING REQUIREMENTS OF ASTM D 2028 AND AASHTO M81.

B. TACK COAT SHALL BE EMULSIFIED ASPHALT CRS-1, MEETING REQUIREMENTS OF VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 210.

C. SEAL COAT LIQUID ASPHALT SHALL MEET REQUIREMENTS OF VDOT SECTION 210, (CRS-2) - VARIABLE BY ONE PERFORMANCE GRADE.

D. TYPE III, SUBGRADE SEPARATION AND STABILIZATION GEOTEXTILE MEETING REQUIREMENTS OF AASHTO TYPE III, (TYPAR 3401 OR EQUIVALENT) SHALL BE USED AS NOTED ON PROJECT PLANS AND STANDARD DETAILS.

E. PAVEMENT REINFORCING FABRIC SHALL BE A/OMAT C040 OR EQUAL AND MEET OR EXCEED AASHTO M288-00, PAVING FABRIC REQUIREMENTS AND CONFORM TO AASHTO NATIONAL TRANSPORTATION PRODUCT EVALUATION PROGRAM. THE FABRIC IS NEEDLE PUNCHED, NON-WOVEN AND HEAT TREATED ON ONE SIDE.

2.03 SUBMIT JOB MIX FORMULA FOR EACH MIXTURE TO BE SUPPLIED WITHIN 30 DAYS OF CONTRACT AWARD. ASPHALT CONCRETE PAVEMENT SHALL BE AS SPECIFIED BELOW:

A. ASPHALT CONCRETE BASE COURSE SHALL BE VDOT BM-25.0 (PG 64-22) MEETING REQUIREMENTS OF VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 211 (E).

B. ASPHALT CONCRETE SURFACE COURSE SHALL BE VDOT SM-9.5A OR SM-12.5D (PG 64-22) MEETING REQUIREMENTS OF VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 211(E), TYPE AS DETERMINED BASED ON STREET CLASSIFICATION AND AS SHOWN ON STANDARD DETAILS.

2.04 MATERIALS FOR USE WITH ASPHALT SURFACE TREATMENT

A. SEAL COAT SHALL BE EMULSIFIED ASPHALT CRS-2, MEETING REQUIREMENTS OF VDOT SECTION 210.

B. COVER MATERIAL SHALL BE VDOT SIZE 78 OR 8, COARSE AGGREGATE AS DEFINED IN VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 203 - COARSE AGGREGATE.

2.05 CONCRETE PAVING MATERIALS SHALL MEET REQUIREMENTS OF VDOT SPECIFICATION FOR HYDRAULIC CEMENT CONCRETE PAVEMENT - SECTION 217 EXCEPT AS INDICATED ON THE DRAWINGS OR AS MODIFIED BY THE FOLLOWING:

A. CONCRETE: 28-DAY STRENGTH 3,000 PSI

B. PLAIN AND DEFORMED BARS FOR DOWELS AND REINFORCING STEEL: ASTM A 615, GRADE 60.

C. JOINT SEALER SHALL BE SILICONE SEALER IN ACCORDANCE WITH VDOT SECTION 212.02.

D. JOINT FILLER SHALL BE EXPANDED RUBBER MEETING REQUIREMENTS OF VDOT SECTION 212.02.

2.06 CONCRETE FOR SIDEWALKS AND CURB AND GUTTER SHALL BE CLASS A3 AS SPECIFIED IN SECTION 217 OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

2.07 WELDED WIRE FABRIC SHALL MEET THE REQUIREMENTS OF SECTION 223 OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS.

2.08 PAINT FOR PAVEMENT MARKINGS SHALL BE TRAFFIC LANE MARKING PAINT, FACTORY MIXED, QUICK-DRYING, AND NONBLEEDING. PAINT SHALL MEET REQUIREMENTS OF VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 231 FOR TRAFFIC LINE MARKING PAINT EXCEPT THAT BEADS FOR REFLECTORIZING WILL NOT BE REQUIRED.

2.09 GUARDRAIL, POSTS, TERMINALS, AND ACCESSORIES SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE STANDARDS.

3. EXECUTION

3.01 NEW PAVEMENT SECTION

A. SUBGRADE PREPARATION: SUBGRADE PREPARATION SHALL CONSIST OF THE FINAL MACHINING OF THE SUBGRADE IMMEDIATELY PRIOR TO PLACING THE AGGREGATE BASE COURSE. THE SURFACE SHALL BE TRUE TO LINE AND GRADE. CONSTRUCTION METHODS AND EQUIPMENT SHALL CONFORM TO APPLICABLE PORTIONS OF SECTION 305, "SUBGRADE AND SHOULDERS," OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

B. AGGREGATE BASE COURSE CONSTRUCTION METHODS AND EQUIPMENT SHALL CONFORM TO REQUIREMENTS OF SECTION 309, "AGGREGATE BASE COURSE," OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

C. ASPHALT CONCRETE PAVEMENT CONSTRUCTION METHODS SHALL CONFORM TO SECTION 315(E), "ASPHALT CONCRETE PAVEMENT," OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

(1) APPLY PRIME COAT AT RATE OF 0.20 TO 0.50 GALLON PER SQUARE YARD OVER COMPACTED AGGREGATE BASE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 311(E), "PRIME COAT."

(2) APPLY TACK COAT TO CONTACT SURFACES OF PREVIOUSLY CONSTRUCTED ASPHALT OR HYDRAULIC CEMENT CONCRETE AND SURFACES ABUTTING OR PROJECTING INTO ASPHALT CONCRETE PAVEMENT. APPLY AT RATE OF 0.05 TO 0.15 GALLON PER SQUARE YARD OF SURFACE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE SPECIFICATIONS, SECTION 310(E), "TACK COAT."

3.02 ASPHALT SURFACE TREATMENT

A. SUBGRADE PREPARATION: SUBGRADE PREPARATION SHALL CONSIST OF THE FINAL MACHINING OF THE SUBGRADE IMMEDIATELY PRIOR TO PLACING THE AGGREGATE BASE COURSE. THE SURFACE SHALL BE TRUE TO LINE AND GRADE. CONSTRUCTION METHODS AND EQUIPMENT SHALL CONFORM TO APPLICABLE PORTIONS OF SECTION 305 "SUBGRADE AND SHOULDERS," OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

B. AGGREGATE BASE COURSE CONSTRUCTION METHODS AND EQUIPMENT SHALL CONFORM TO REQUIREMENTS OF SECTION 309, "AGGREGATE BASE COURSE," OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

C. ASPHALT SURFACE TREATMENT CONSTRUCTION METHODS SHALL CONFORM TO SECTION 313(E), "ASPHALT SURFACE TREATMENT," OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

(1) SURFACE TREATMENT SHALL CONSIST OF THREE SEAL COURSES. FIRST COURSE SHALL CONSIST OF AN APPLICATION OF LIQUID BITUMINOUS MATERIAL CRS-2 AT THE RATE OF 0.3 GALLON PER SQUARE YARD COVERED WITH NO. 8 OR NO. 78 STONE AT THE RATE OF 25 POUNDS PER SQUARE

YARD. THE SECOND COURSE SHALL BE APPLIED AT THE SAME RATES AS THE FIRST COURSE, (I.E. 0.3 GAL/SYD CRS-2 AND 25 LBS/SYD STONE). THE THIRD COURSE SHALL BE CRS-2 APPLIED AT THE RATE OF 0.3 GALLON PER SQUARE YARD COVERED WITH NO. 8 OR NO. 78 STONE AT THE RATE OF 25 POUNDS PER SQUARE YARD.

3.03 RESURFACING

A. PREPARATION OF SURFACE: PRIOR TO BEGINNING PAVING OPERATIONS, THE EXISTING AREAS TO BE RESURFACED SHALL BE THOROUGHLY CLEANED BY THE CONTRACTOR TO THE SATISFACTION OF THE ENGINEER. THIS CLEANING SHALL INCLUDE SWEEPING OF THE STREETS WITH A POWER OPERATED BROOM, CUTTING EXCESS DEBRIS WITH A GRADER, WASHING WITH A WATER TRUCK, AND HAND CLEANING ANY DEBRIS LEFT OVER AFTER THIS OPERATION IS COMPLETE. CLEANING OPERATIONS SHALL COMMENCE JUST PRIOR TO THE RESURFACING OF STREETS. IN ADDITION, THE CONTRACTOR SHALL EXPOSE ANY EXISTING PAVING AREAS THAT HAVE BEEN COVERED BY SOIL, GRASS, OR DEBRIS. ALL HORIZONTAL AND VERTICAL SURFACES TO BE IN CONTACT WITH NEW PAVEMENT SHALL BE THOROUGHLY CLEANED AND TACKED BEFORE RESURFACING. ANY EXCESS MATERIAL LEFT OVER AFTER THIS OPERATION SHALL BE REMOVED OR SPREAD OUT TO THE SATISFACTION OF THE ENGINEER. DRY POWER BROOMING WILL NOT BE PERMITTED.

B. ADJUSTMENT OF MANHOLES, GRATES, VALVE BOXES, ETC.: PRIOR TO RESURFACING OF THE STREETS, ALL NEW AND EXISTING MANHOLES, GRATES, AND VALVE BOXES SHALL BE RAISED TO MATCH THE NEW GRADE OF THE STREET WITHIN A TOLERANCE OF ±0.01 FEET OF FINISHED GRADE. THE CONTRACTOR SHALL CONFIRM NEW PAVEMENT ELEVATIONS WITH THE ENGINEER PRIOR TO ADJUSTMENT. ADJUSTMENT SHALL RESULT IN UNIFORM MATCH TO THE SURROUNDING PAVEMENT ON ALL SIDES OF THE CASTING. ADJUSTMENTS SHALL BE TEMPORARY UNTIL PAVING IS COMPLETE, FINAL GROUTING AND SEALING SHALL BE COMPLETED IMMEDIATELY AFTER PAVING IS COMPLETE, IN ACCORDANCE WITH BID ITEM UNIT PRICE DESCRIPTIONS. CASTINGS SHALL BE STABILIZED WITH CONCRETE IN ACCORDANCE WITH STANDARD DETAILS AT THE DIRECTION OF THE ENGINEER.

C. THE CONTRACTOR SHALL CONDUCT ONE DENSITY CHECK PER DAY OR FOR EVERY 1000 TONS OF FINAL ASPHALT PLACEMENT IN ACCORDANCE WITH VTM-76 AND VTM-81 AS DIRECTED BY THE ENGINEER. THE AIR VOID RATIO IN WEARING COURSES SHALL NOT EXCEED 7.5 PERCENT AIR VOIDS. WEARING COURSE DENSITY SHALL BE BETWEEN 122 AND 127 LBS/SYD/INCH THICKNESS AND BASE MIX LAYERS SHALL WEIGH BETWEEN 112 AND 117 LBS/SYD/INCH THICKNESS. THE CITY RESERVES THE RIGHT TO APPLY A DEDUCTIVE ADJUSTMENT OF ONE PERCENT FOR EACH PERCENTAGE VARIANCE FROM THESE TARGET VALUES TO THE UNIT PRICE OF THE ASPHALT. FOR VARIANCES TOTALING OVER 25 PERCENT THE CONTRACTOR SHALL REMOVE AND REPLACE THE OUT OF SPECIFICATION MATERIAL AT NO ADDITIONAL COST. IF REQUESTED BY THE CITY ENGINEER, THE CONTRACTOR SHALL CUT SAMPLES FOR TESTING DEPTH AND DENSITY. SAMPLES SHALL BE TAKEN FOR FULL DEPTH AT THE LOCATIONS AS SELECTED BY THE CITY ENGINEER. THE REMOVED PAVEMENT SHALL BE REPLACED WITH NEW MIXTURE AND REFINISHED. NO ADDITIONAL COMPENSATION WILL BE MADE FOR SUCH WORK.

D. THE USE OF RECYCLED ASPHALT OR AGGREGATE IN ANY ASPHALT CONCRETE SURFACE SHALL BE IN ACCORDANCE WITH SECTION 211, "ASPHALT CONCRETE MATERIALS', OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS, LATEST REVISION. PAVEMENT OVERLAY MATERIAL SHALL BE SM-9.5A OR 12.5D AS PREDICATED BY STREET CLASSIFICATION OR AS DIRECTED BY THE ENGINEER.

STREET CROSS-SECTION PROFILE SHALL MEET MINIMUM SLOPES AS OUTLINED ON STANDARD DETAILS.

3.04 CONCRETE WALKS: CONSTRUCT IN ACCORDANCE WITH CITY OF LYNCHBURG SPECIFICATIONS AND STANDARD DETAILS.

3.05 CONCRETE CURBS AND COMBINATION CURB AND GUTTER: CONSTRUCT IN ACCORDANCE WITH CITY OF LYNCHBURG SPECIFICATIONS AND STANDARD DETAILS.

3.06 THE CONTRACTOR SHALL PROTECT THE PORTLAND CEMENT CONCRETE AND ITS APPURTENANCES AGAINST RAIN, PUBLIC TRAFFIC, AND TRAFFIC CAUSED BY HIS OWN EMPLOYEES AND AGENTS UNTIL IT HAS OBTAINED ITS FINAL SET. THIS SHALL INCLUDE FURNISHING WATCHMEN AND FLAGMEN TO DIRECT TRAFFIC. THE ERECTION AND MAINTENANCE OF WARNING SIGNS, LIGHTS, PAVEMENT BRIDGES OR CROSSOVERS, AND PROPER COVER MATERIAL TO PROTECT AGAINST THE EFFECTS OF RAIN.

3.07 PAVEMENT REPAIRS

A. PAVEMENT REPAIRS SHALL BE INSTALLED TO MATCH DEPTH OF SURROUNDING PAVEMENT IN ACCORDANCE WITH STANDARD DETAILS.

B. WHEN PAVEMENT, CURB AND GUTTER, OR SIDEWALKS MUST BE CUT, MAKE THE CUT IN A STRAIGHT LINE, PARALLEL TO, AND 6 INCHES WIDER THAN TRENCH, ON EACH SIDE, TO PROVIDE AN UNDISTURBED SHOULDER UNDER THE NEW WORK.

C. WHERE TRENCHES CROSS STREETS, DISTURB NO MORE THAN ONE-HALF OF THE STREET WIDTH AT ONE TIME, AND RESTORE THE FIRST TRENCH OPENING TO SATISFACTORY TRAVELABLE CONDITION BEFORE THE SECOND HALF IS EXCAVATED. AVOID PLACEMENT OF EXCAVATED MATERIAL ON EXISTING PAVEMENT WHEREVER POSSIBLE. CLEAN THE PAVEMENT BY AN APPROVED METHOD. USE NO CLEATED EQUIPMENT ON PAVEMENTS. ALTER NORMAL TRAFFIC FLOW ONLY WITH PERMISSION FROM THE OWNER.

D. REPLACE FINISH SURFACE COURSE DEPTH EQUAL TO THE ORIGINAL PAVEMENT SURFACE COURSE DEPTH. PATCH SURFACE GRADE TOLERANCE WILL BE TESTED USING A TEN FOOT STRAIGHT EDGE, THE SURFACE SHALL NOT VARY BY MORE THAN 0.25 INCHES BETWEEN ANY TWO CONTACT POINTS ON THE STRAIGHT EDGE, ALLOWING FOR EXISTING STREET TOPOGRAPHY AS REQUIRED. ALL VARIANCES OVER THIS AMOUNT WHICH ARE EXHIBITED AFTER THE PATCH HAS BEEN SUBJECT TO NORMAL TRAFFIC FLOW FOR A WEEK SHALL BE CORRECTED AT CONTRACTOR EXPENSE.

E. RESTORE PRIVATE ENTRANCES TO THE ORIGINAL CONDITIONS OR PROVIDE NO LESS THAN 6 INCHES OF AGGREGATE BASE COURSE, WHICHEVER CONDITION IS BETTER.

F. PAVEMENT REINFORCING FABRIC SHALL BE APPLIED AS DIRECTED BY THE ENGINEER FOR CONTROL OF REFLECTIVE CRACKING ON STREETS TO BE OVERLAID. FABRIC SHALL BE APPLIED IN CONJUNCTION WITH FINAL PAVING IN ACCORDANCE WITH VDOT CRITERIA AND CITY STANDARD SPECIFICATIONS.

3.08 TEMPORARY STONE PATCHES SHALL CONSIST OF 8 INCHES OF VDOT NO. 21 OR 21A COMPACTED STONE TOPPED WITH SEAL COAT. THE TEMPORARY PATCH SHALL BE INSTALLED TO THE SAME ELEVATION AS THE SURROUNDING PAVEMENT AND MAY BE USED AS A PERMANENT PATCH IN RESIDENTIAL STREETS TO BE REBUILT. PERMANENT HYBRID PATCHES CONSISTING OF 12 INCHES OF STONE, GEOTEXTILE, AND SURFACE TREATMENT SHALL BE USED IN RESIDENTIAL STREETS WHICH ARE NOT TO BE REBUILT AND THAT WILL RECEIVE PROFILING AND OVERLAY, OR A MINIMUM OF 1.5 INCHES OF OVERLAY AFTER ALL CONSTRUCTION IS COMPLETE, OTHERWISE

PERMANENT ASPHALT PATCHES SHALL BE INSTALLED IN ACCORDANCE WITH STANDARD DETAILS. TEMPORARY ASPHALT COLD PATCHES OR CONCRETE PATCH SHALL BE USED DURING PERIODS WHEN HOT MIX IS NOT AVAILABLE, THESE TEMPORARY PATCHES SHALL BE REMOVED AND REPLACED WITH PERMANENT PATCH WHEN WEATHER PERMITS.

3.09 PAVEMENT REPAIRS OR TEMPORARY PATCHES SHALL BE PROVIDED WITHIN 3 WORKING DAYS OF ALL BACKFILLED TRENCHES.

3.10 DO NOT BLOCK PRIVATE ENTRANCES EXCEPT FOR SHORT PERIODS, AND MAINTAIN INGRESS AND EGRESS TO ADJACENT PROPERTY AT ALL TIMES.

3.11 DO NOT CLOG STREET DRAINAGE. MAINTAIN SHOULDERS, GUTTERS, AND DITCHES AFFECTED BY TRENCHING OPERATIONS TO CARRY DRAINAGE FLOWS.

3.12 PAINT TEMPORARY TRAFFIC AND LANE MARKINGS AS DIRECTED BY OWNER. THE OWNER WILL PAINT THE FINAL TRAFFIC AND LANE MARKINGS ON ALL STREETS.

3.13 RESTORE CONCRETE WALKS AND CURB AND GUTTER TO THE ORIGINAL CONDITION.

3.14 CONSTRUCT GUARDRAILS AND ACCESSORIES IN ACCORDANCE WITH LATEST EDITION OF VDOT, "ROAD AND BRIDGE STANDARDS", AS DIRECTED BY THE ENGINEER.

3.15 UPON COMPLETION OF CONSTRUCTION WORK AND AFTER SPOILS AND DEBRIS HAVE BEEN REMOVED, REGRADE ANY AREAS DISTURBED BY PAVING OPERATIONS.

END OF SECTION

SECTION 02575 - PLANING ASPHALT PAVEMENT

1. GENERAL

1.01 REFERENCE SPECIFICATIONS WHERE APPLICABLE TO WORK UNDER THIS SECTION ARE REFERRED TO BY ABBREVIATIONS AS FOLLOWS:

A. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS.....AASHTO

B. VIRGINIA DEPARTMENT OF TRANSPORTATION.....VDOT

1.02 PROJECT CONDITIONS: MILLING SHALL NOT BE PERFORMED WHEN THERE IS SNOW OR ICE ON THE PAVEMENT SURFACE.

1.03 FINAL MILLING SHALL NOT BE PERFORMED ON A PARTICULAR STREET UNTIL ALL CURBS, GUTTERS, DRIVEWAY ENTRANCES, AND OTHER CONCRETE ITEMS HAVE BEEN COMPLETED ON THE PARTICULAR STREET.

1.04 FINAL MILLING SHALL NOT BE PERFORMED MORE THAN 1 WEEK BEFORE RESURFACING.

2. PRODUCTS: NOT USED

3. EXECUTION

3.01 CLEAN THE PAVEMENT SURFACE OF EXCESSIVE DIRT, MUD, OR OTHER FOREIGN MATERIAL IMMEDIATELY PRIOR TO THE PLANING OPERATION.

3.02 PROVIDE SELF-PROPELLED PLANING UNIT CAPABLE OF REMOVING THE ASPHALT PAVEMENT TO THE DEPTHS, WIDTHS, AND TYPICAL SECTIONS AS SHOWN ON STANDARD DETAILS, OR AS DESCRIBED HEREIN. THE EQUIPMENT SHALL HAVE THE FOLLOWING CAPACITIES:

A. A COLD MILLING MACHINE CAPABLE OF CUTTING AT LEAST 2 INCHES DEEP AND 55 INCHES WIDE IN FLEXIBLE PAVEMENT WHILE LEAVING A UNIFORM CUT AND DRIVABLE SURFACE CAPABLE OF HANDLING TRAFFIC PRIOR TO PLACEMENT OF A NEW ASPHALT OVERLAY. THE GROUND SPEED OF THE MACHINE SHALL BE INDEPENDENT OF THE CUTTING EQUIPMENT. THE MACHINE SHALL MAINTAIN A SHARP CUTTING EDGE AT ALL TIMES. THE MACHINE SHALL HAVE A SELF CONTAINED WATER SYSTEM FOR CONTROL OF DUST AND FINE PARTICLES. THE MACHINE SHALL BE CAPABLE OF WORKING IN WET AND DRY CONDITIONS WITH TEMPERATURES DOWN TO 32 DEGREES F. THE WIDTH OF THE MACHINE SHALL BE SUCH TO ALLOW FOR ONE LANE OF TRAFFIC AT ALL TIMES. THE MACHINE SHALL BE CAPABLE OF CUTTING WITHIN 1 INCH OF MANHOLES, VALVE BOX TOPS, AND FACEDOWN WALKS WITH A MINIMUM RADIUS OF 5 FEET.

B. IF THE MACHINE IS NOT SELF-LOADING, THEN A CAPABLE LOADER SHALL BE FURNISHED FOR PLACING THE MATERIAL ONTO TRUCKS.

C. A REGENERATIVE STREET SWEEPER IS TO BE USED FOR CLEANING THE PLANED SURFACES UPON COMPLETION OF MILLING OPERATIONS. DRY POWER BROOMING IS PROHIBITED.

D. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING WATER FOR MILLING OPERATIONS.

E. TRAFFIC CONTROL AND FLAGMEN SHALL BE AS REQUIRED BY THE CITY TRAFFIC ENGINEER. ALL STREET APPURTENANCES, MANHOLES, VALVE BOXES, ETC.,

SHALL BE ADJUSTED AFTER MILLING SO THEY ARE NOT A HAZARD TO PASSING VEHICLES. MILLING SHALL BE CONDUCTED SO WATER DOES NOT POND ON ROADWAY, THIS SHALL INCLUDE PROVISION OF TEMPORARY DRAINAGE IMPROVEMENTS AS REQUIRED, AT NO ADDITIONAL COST TO THE OWNER.

F. THE PLANING MACHINE SHALL BE EQUIPPED WITH A GRADE CONTROL SYSTEM WHICH SHALL AUTOMATICALLY CONTROL THE LONGITUDINAL PROFILE AND CROSS SLOPE OF THE MILLED SURFACE BY THE USE OF ONE OR MORE SKID SENSORS MOVING ALONG THE PAVEMENT SURFACE.

3.03 WHERE ASPHALT PAVEMENT EXTENDS INTO THE EXISTING CURB AND GUTTER, THE CONTRACTOR SHALL BE REQUIRED TO PLANE AT DIFFERENT SLOPES. THE FIRST CUTS SHALL REMOVE THE MATERIAL EXISTING ABOVE THE GUTTER LINE. THESE CUTS SHALL BE MADE AT THE APPROPRIATE GUTTER SLOPE (1/2 INCH:1 FOOT) FOR 2-FOOT CURB AND GUTTER AND (1 INCH:1 FOOT) FOR 2.5-FOOT CURB AND GUTTER. ANY CURB AND GUTTER WITH A DIFFERENT SLOPE SHALL BE PLANED AT THE EXISTING CURB AND GUTTER SLOPE.

3.04 THE LAST CUTS SHALL REMOVE THE MATERIAL TO A DEPTH OF 1-1/2 INCHES BELOW THE GUTTER LINE WITH A STREET CROSS-SECTION SLOPE OF (1/4 INCH:1 FOOT) OR TO SLOPE OF EXISTING STREET.

3.05 WHERE CURB AND GUTTER EXISTS BUT THE PAVEMENT IS AT OR BELOW THE EXISTING GUTTER LINE, THE PAVEMENT SHALL BE CUT TO A DEPTH OF 1-1/2 INCHES BELOW THE GUTTER LINE WHILE ADJUSTING THE STREET CROSS-SECTION TO 1/4 INCH:1 FOOT TOWARD THE CENTERLINE OF THE STREET.

3.06 WHERE EXISTING STRAIGHT CURBING HAS PAVEMENT BUILT UP TO EXPOSE LESS THAN 6 INCHES OF CURBING, THE PAVEMENT SHALL BE PLANED DOWN ON GRADE OF 1/4 INCH:1 FOOT OR WHATEVER THE EXISTING GRADE OF THE STREET BACK TO THE STREET CENTERLINE UNTIL A DESIRED HEIGHT OF CURBING IS EXPOSED.

3.07 WHERE CENTER OF PAVEMENT HAS CORRECT CROWN, BUT PAVEMENT HAS RUTTING OR RIPPLES (POSSIBLY CAUSED BY VEHICULAR BRAKING), THE PAVEMENT SHALL BE PLANED TO THE DEPTH NECESSARY TO REMOVE ALL SUCH DEFECTS.

3.08 PROVIDE ADDITIONAL EQUIPMENT NECESSARY TO SATISFACTORILY REMOVE THE PAVEMENT IN THE AREA OF MANHOLES, WATER VALVES, CURB AND GUTTER, AND OTHER OBSTRUCTIONS.

3.09 REPAIR OR REPLACE DAMAGED MANHOLES, VALVE BOXES, UTILITY LINES, OR PAVEMENT THAT IS TORN, CRACKED, GOUGED, RUTTED, BROKEN, OR UNDERCUT. ADJUST ALL NEW AND EXISTING MANHOLES AND UTILITY CASTINGS IN THE STREET SECTION TO MATCH PROFILE OF NEW STREET CROSS-SECTION. CONTRACTOR WILL BE REIMBURSED FOR ADJUSTMENT OF EXISTING STRUCTURES AS A SEPARATE PAY ITEM AS REQUIRED.

3.10 MATERIAL REMOVED BY PLANING SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND BE REMOVED FROM THE PROJECT. MILLINGS MAY BE REUSED ON THE PROJECT AS DIRECTED BY THE ENGINEER ON A UNIT COST BASIS AS OUTLINED IN THE BID SCHEDULE.

END OF SECTION

SECTION 02660 - WATER DISTRIBUTION SYSTEM

1. GENERAL

1.01 SYSTEM DESCRIPTION: THIS SECTION SPECIFIES ALL WATER SYSTEM WORK ON THIS PROJECT.

1.02 REFERENCE SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN NATIONAL STANDARDS INSTITUTE..... ANSI

B. AMERICAN SOCIETY FOR TESTING AND MATERIALS..... ASTM

C. AMERICAN WATER WORKS ASSOCIATION..... AWWA

D. COMMERCIAL STANDARD (NATIONAL BUREAU OF STANDARDS)..... CS

E. VIRGINIA DEPARTMENT OF HIGHWAYS AND TRANSPORTATION..... VDOT

1.03 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMENTS.

A. SUBMITTAL: SHOP DRAWINGS OF THE FOLLOWING:

(1) PIPE AND FITTINGS

(2) VALVES AND TAPPING VALVE ASSEMBLIES

(3) VALVE BOXES

(4) COMBINATION AIR RELEASE VALVES

(5) HYDRANTS

(6) FLEXIBLE COUPLINGS

(7) RESTRAINED JOINTS

B. SUBMITTAL: BACTERIOLOGICAL TEST REPORTS.

C. SUBMITTAL: DUCTILE IRON PIPE DETAILS

D. SUBMITTAL: PIPE FITTING DETAILS

E. SUBMITTAL: COPPER PIPING DETAILS

F. SUBMITTAL: RESTRAINED JOINT DETAILS

G. SUBMITTAL: NONRISING STEM (NRS) GATE VALVE DETAILS

H. SUBMITTAL: TAPPING VALVE ASSEMBLY DETAILS

I. SUBMITTAL: VALVE BOX DETAILS

J. SUBMITTAL: BALL VALVE DETAILS

K. SUBMITTAL: HYDRANT DETAILS

L. SUBMITTAL: BLOW-OFF ASSEMBLY DETAILS

M. SUBMITTAL: WATER SERVICE DETAILS

N. SUBMITTAL: BACTERIOLOGIC TEST REPORTS

1.04 PROJECT CONDITIONS:

A. WATER SYSTEM IMPROVEMENTS AND CONSTRUCTION OPERATIONS SHALL FOLLOW VIRGINIA DEPARTMENT OF HEALTH AND VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY STANDARDS, INCLUDING REQUIREMENTS FOR SEPARATION OF WATER MAINS AND SANITARY AND COMBINED SEWER LINES.

B. PARALLEL INSTALLATION

(1) NORMAL CONDITIONS - WATER LINES SHALL BE CONSTRUCTED AT LEAST 10 FEET HORIZONTALLY FROM A SEWER OR SEWER MANHOLE WHENEVER POSSIBLE, THE DISTANCE SHALL BE MEASURED EDGE-TO-EDGE.

(2) UNUSUAL CONDITIONS - WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF AT LEAST 10 FEET, THE WATER LINE MAY BE LAID CLOSER TO A SEWER OR SEWER MANHOLE PROVIDED THAT:

a. THE BOTTOM (INVERT) OF THE WATER LINE IS AT LEAST 18 INCHES ABOVE THE TOP (CROWN) OF THE SEWER.

b. WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF AWWA APPROVED DUCTILE IRON WATER PIPE PRESSURE-TESTED IN PLACE TO 50 PSI WITHOUT LEAKAGE PRIOR TO BACKFILLING. SEWER MANHOLES WITHIN TEN FEET OF A WATERLINE SHALL BE OF WATERTIGHT CONSTRUCTION, INCLUDING THE FRAME AND COVER AND LEAK TESTED IN PLACE.

C. CROSSING

(1) NORMAL CONDITIONS - WATER LINES CROSSING OVER SEWERS SHALL BE LAID TO PROVIDE A SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE SEWER WHENEVER POSSIBLE.

(2) UNUSUAL CONDITIONS - WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION DESCRIBED IN CROSSING, NORMAL CONDITIONS, PARAGRAPH ABOVE, THE FOLLOWING CONSTRUCTION SHALL BE USED.

a. SEWERS PASSING OVER OR UNDER WATER LINES SHALL BE CONSTRUCTED OF THE MATERIALS DESCRIBED IN PARALLEL INSTALLATION, UNUSUAL CONDITIONS - PARAGRAPH 2 ABOVE.

b. WATER LINES PASSING UNDER SEWERS SHALL, IN ADDITION, BE PROTECTED BY PROVIDING:

(1) A VERTICAL SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE SEWER AND THE TOP OF THE WATER LINE,

(2) ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS TO PREVENT EXCESSIVE DEFLECTION OF THE JOINTS AND SETTLING ON AND BREAKING WATER LINE,

(3) THAT THE LENGTH OF THE WATER LINE BE CENTERED AT THE POINT OF THE CROSSING SO THAT JOINTS SHALL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.

(3) WHEN OTHER UNUSUAL CONDITIONS ARE ENCOUNTERED IN THE FIELD THAT ARE NOT DESCRIBED ABOVE, THE CONTRACTOR SHALL CONTACT THE ENGINEER FOR DIRECTION PRIOR TO PROCEEDING.

D. SANITARY AND/OR COMBINED SEWERS OR SEWER MANHOLES - NO WATER PIPES SHALL PASS THROUGH OR COME IN CONTACT WITH ANY PART OF A SEWER OR SEWER MANHOLE.

1.05 OPERATION OF VALVES AND HYDRANTS: THE CITY OF LYNCHBURG WILL BE THE SOLE OPERATOR OF ALL VALVES AND HYDRANTS ON THE CITY WATER SYSTEM. ALL WATER MAIN TIE-INS SHALL BE COORDINATED WITH THE CITY UTILITIES ENGINEER.

2. PRODUCTS

2.01 DUCTILE IRON PIPE SHALL MEET REQUIREMENTS OF ANSI/AWWA C151 FOR THE PRESSURE AND THICKNESS CLASS 350. THICKNESS CLASSES SHALL MEET REQUIREMENTS OF ANSI/AWWA C150. THE DUCTILE IRON PIPE SHALL BE CEMENT MORTAR LINED WITH A SEAL COAT IN ACCORDANCE WITH AWWA C104/ANSI 21.4. OUTSIDE COAT SHALL BE A MINIMUM OF 1-MIL BITUMINOUS PAINT ACCORDING TO AWWA C151/ANSI A21.51 SECTION 51-8.1. DUCTILE IRON PIPE SHALL BE AS MANUFACTURED BY THE AMERICAN CAST IRON PIPE COMPANY, UNITED STATES PIPE AND FOUNDRY COMPANY, GRIFFIN PIPE PRODUCTS COMPANY, OR MCWANE CAST IRON PIPE COMPANY. THIS INFORMATION SHALL BE CLEARLY MARKED ON THE MATERIALS SUPPLIED TO THE PROJECT.

A. FITTINGS FOR DUCTILE IRON PIPE

(1) DUCTILE IRON FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C110 OR C153 FOR COMPACT FITTINGS. ALL DUCTILE IRON FITTINGS SHALL HAVE A MINIMUM WORKING PRESSURE RATING OF 350 PSI, AND SHALL BE CEMENT MORTAR LINED AND BITUMINOUS COATED IN ACCORDANCE WITH AWWA C104. THE FITTINGS SHALL BE TESTED AND THE MANUFACTURER SHALL PROVIDE CERTIFIED HYDROSTATIC TEST RESULTS WHEN REQUESTED BY THE CITY. GLANDS, GASKETS, AND BOLTS SHALL CONFORM TO AWWA C111, PUSH ON FITTINGS WILL NOT BE PERMITTED.

B. MECHANICAL JOINTS AND JOINTING MATERIALS SHALL MEET REQUIREMENTS OF ANSI/AWWA C111.

(1) MECHANICAL JOINT RESTRAINT SHALL BE "MEGALUG" SERIES 1100 MANUFACTURED BY EBAA IRON INC. OR SERIES 1400 "BLOCK BUSTER" WEDGE ACTION RETAINER GLAND MANUFACTURED BY UNI-FLANGE, OR "ROMA-GRIP" AS MANUFACTURED BY ROMAC INDUSTRIES.

(2) LOCKED TYPE MECHANICAL JOINTS APPROVED EQUAL TO TR-FLEX AS MANUFACTURED BY U.S. PIPE AND FOUNDRY, FLEX RING AS MANUFACTURED BY AMERICAN DUCTILE IRON PIPE COMPANY, OR SNAP LOK AS MANUFACTURED BY GRIFFIN PIPE PRODUCTS MAY BE USED WHERE RESTRAINED JOINTS ARE REQUIRED.

C. PUSH-ON JOINT AND RUBBER GASKET SHALL MEET REQUIREMENTS OF ANSI/AWWA C111. PUSH-ON JOINT, DUCTILE IRON PIPE SHALL CONFORM TO AWWA C151/ANSI A21.51 (SUCH AS "FASTITE," "TYTON," OR "BELL-TITE.").

(1) RESTRAINED PUSH-ON JOINTS MAY BE USED WHERE RESTRAINED JOINTS ARE REQUIRED.

D. CEMENT MORTAR LINING WITH BITUMINOUS SEAL COAT FOR DUCTILE IRON PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C104.

(1) CEMENT MORTAR LINING SHALL BE STANDARD THICKNESS.

E. EXTERIOR, BITUMINOUS COATING FOR DUCTILE IRON PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C151 AS APPLICABLE. PIPE AND FITTINGS TO BE PAINTED SHALL HAVE A STANDARD FACTORY PRIME.

2.02 COPPER PIPING SHALL MEET REQUIREMENTS OF ASTM B 88 FOR TYPE "L" COPPER, HARD DRAWN PIPE FOR ABOVE GROUND, AND TYPE "K" SOFT COPPER TUBE FOR BELOW GROUND. COPPER PIPING SHALL BE USED FOR ALL PIPING BETWEEN ¾ AND 2 INCHES IN DIAMETER.

A. FITTINGS FOR COPPER PIPING SHALL MEET REQUIREMENTS OF ANSI B16.22 FOR WROUGHT COPPER, FLARED, COMPRESSION FITTINGS MAY BE USED AS SPECIFICALLY AUTHORIZED BY THE ENGINEER.

B. 2-INCH CORPORATION STOPS SHALL BE FORD FB-600, MUELLER COMPANY H-15000 OR APPROVED EQUAL.

2.03 METAL TIE ROD RESTRAINTS SHALL BE A307 STEEL WITH A CADMIUM COATING. SIZE AND NUMBER OF RODS AND CLIPS SHALL BE AS DETAILED ON DRAWINGS.

2.04 NIPPLES SHALL MEET REQUIREMENTS OF CS 5. NIPPLES SHALL BE OF SAME MATERIAL AND WEIGHT OF PIPE WITH WHICH USED, EXCEPT THAT NIPPLES HAVING AN UNTHREADED SECTION OF 1 INCH OR LESS SHALL BE EXTRA HEAVY. THE USE OF RUNNING THREAD NIPPLES SHALL NOT BE APPROVED.

2.05 CONCRETE FOR REACTION ANCHORS SHALL BE CLASS A3 AS SPECIFIED IN SECTION 217 OF VDOT ROAD AND BRIDGE SPECIFICATIONS.

2.06 GATE VALVES AND TAPPING VALVE ASSEMBLIES

A. NONRISING STEM GATE VALVES 4 INCHES AND LARGER SHALL MEET REQUIREMENTS OF AWWA C509 "AWWA STANDARD FOR RESILIENT SEATED GATE VALVES FOR WATER AND SEWERAGE SERVICE." WORKING PRESSURE SHALL BE AT LEAST 200 PSI FOR ALL GATE VALVES. ALL INTERNAL PARTS SHALL BE ACCESSIBLE WITHOUT REMOVING THE VALVE BODY FROM THE LINE. THE WEDGE SHALL BE CAST IRON COMPLETELY ENCASED IN RESILIENT MATERIAL THAT IS PERMANENTLY BONDED TO THE WEDGE WITH TEARING BOND MEETING ASTM D429 AND AWWA C550. ALL VALVE ENDS SHALL BE MECHANICAL JOINT TYPE, COMPATIBLE WITH PIPING SYSTEMS IN WHICH VALVES ARE INSTALLED. ALL VALVE STEMS SHALL BE CAST BRONZE, NRS SHALL HAVE INTEGRAL COLLARS IN ACCORDANCE WITH AWWA. NRS VALVE STUFFING BOXES SHALL HAVE DUAL "O"-RING SEALS ABOVE THE THRUST COLLAR, THAT ARE FIELD REPLACEABLE WITHOUT REMOVING VALVE FROM SERVICE. ALL VALVES SHALL BE HYDROSTATICALLY TESTED TO 400 PSI, AND SHALL OPEN COUNTERCLOCKWISE USING A 2-INCH SQUARE OPERATING NUT. ASBESTOS PACKING WILL NOT BE ACCEPTABLE.

B. ALL GATE VALVES FROM 4 THROUGH 18 INCHES SHALL BE, AMERICAN FLOW CONTROL - 2500 NRS, CLOW - RESILIENT WEDGE VALVE, MUELLER A-2360-20, KENNEDY - KENSEAL II, OR APPROVED EQUAL.

C. TAPPING VALVES SHALL MEET REQUIREMENTS OF GATE VALVES SPECIFIED ABOVE EXCEPT THAT SEAT OPENING SHALL BE LARGER THAN NOMINAL SIZE AND VALVE ENDS SHALL BE MECHANICAL JOINT TYPE. TAPPING VALVES SHALL BE "O" RING TYPE WITH MECHANICAL JOINT AND CONFORMING TO AWWA NON-RISING STEM CONSTRUCTION. INLET FLANGE END SHALL BE CLASS 125, APPROVED VALVES ARE AMERICAN FLOW CONTROL - 2500 NRS, CLOW - F-5093, MUELLER T-2360, KENNEDY - KENSEAL II, OR APPROVED EQUAL.

D. GATE VALVES SMALLER THAN 3 INCHES SHALL BE BRONZE, SOLID WEDGE, RISING STEM, AT LEAST 200 PSI WORKING PRESSURE, JENKINS 49-U THREADED ENDS.

E. THE SLEEVE SHALL BE ALL STAINLESS STEEL CONSTRUCTION AND HAVE A FULL CIRCUMFERENCE GASKET FOR A WATERTIGHT SEAL. THE SLEEVE SHALL HAVE A MINIMUM WORKING PRESSURE OF 250 PSIG AND A TEST PRESSURE RATING OF 400 PSIG. THE SLEEVE SHALL BE EQUIPPED WITH A TEST PLUG TO ALLOW FOR PRESSURE TESTING OF THE SEAL PRIOR TO TAPPING. TAPPING SLEEVES SHALL MEET THE REQUIREMENTS OF AWWA C110/ANSI 21.10 AND BE MANUFACTURED BY ROMAC INDUSTRIES, SMITH-BLAIR, OR FORD METER BOX CO. THE TAPPING SLEEVE AND VALVE SHALL BE SUITABLE FOR WET INSTALLATION WITHOUT INTERRUPTION OF WATER SERVICE. THE TAPPING SLEEVE SHALL BE FOR THE SIZE OF PIPE SHOWN ON THE DRAWINGS.

2.07 VALVE BOXES SHALL BE ADJUSTABLE CAST IRON VALVE BOXES, MADE IN THE U.S.A., AND CONSIST OF THE THREE PIECES, THE THREE PIECES BEING A LID, SCREW-TOP ADJUSTABLE RISER, AND A BASE MOUNT.. BASE MOUNT SHALL BE PROPER TYPE AND SIZE FOR THE VALVE WITH WHICH IT IS USED. THE WORD "WATER" SHALL BE CAST OR EMBOSSED ON THE VALVE BOX LID IN LETTERS NOT LESS THAN 1 INCH HIGH. VALVE BOX SHALL EQUAL OR EXCEED THAT AS MANUFACTURED BY CAPITAL FOUNDRY. ALL VALVE BOX COVERS SHALL BE PAINTED WITH TWO COATS OF BLUE PAINT IN ACCORDANCE WITH STANDARDS OF THE AMERICAN PUBLIC WORKS ASSOCIATION'S UTILITY LOCATION AND COORDINATING COUNCIL.

2.08 BALL VALVES SHALL BE OF THE BRONZE TOP ENTRY TYPE AND HAVE A STRAIGHT THROUGH FLOW PASSAGE. VALVES SHALL BE LEVER OPERATED FOR QUARTER TURN OPERATION. BALL VALVES SHALL MEET REQUIREMENTS OF AWWA C507.

2.09 FLEXIBLE COUPLING SHALL BE OF A GASKETED, SLEEVE TYPE. EACH COUPLING SHALL CONSIST OF A STEEL MIDDLE RING, TWO STEEL FOLLOWERS, TWO RUBBER COMPOUNDED WEDGE SECTION GASKETS, AND SUFFICIENT GALVANIZED TRACK-HEAD STEEL BOLTS TO PROPERLY COMPRESS THE GASKETS. COUPLINGS SHALL BE OF THE TYPE TO MATCH PIPING IN WHICH INSTALLED. COUPLINGS SHALL BE SMITH-BLAIR TYPE 441, FORD FC-1 (2" THROUGH 12"), FORD FC-2A (14" THROUGH 24"), OR ROMAC 501 OR APPROVED EQUAL.

2.10 FIRE HYDRANTS SHALL BE OF THE SAFETY FLANGE, COMPRESSION TYPE CLOSING ON LINE PRESSURE - TRAFFIC MODEL BREAKAWAY TYPE, MEETING REQUIREMENTS OF AWWA C502, "AWWA STANDARD FOR FIRE HYDRANTS FOR ORDINARY WATER WORKS SERVICE." HYDRANTS SHALL HAVE A BARREL DIAMETER OF NOT LESS THAN 7 INCHES, A HYDRANT SEAT OPENING DIAMETER NOT LESS THAN 5-1/4 INCHES, AND SHALL BE EQUIPPED WITH TWO 2-1/2 INCH HOSE NOZZLES AND ONE 4-1/2 INCH PUMPER CONNECTION. BRONZE-TO-BRONZE THREADS SHALL BE PROVIDED BETWEEN HYDRANT SEAT OR SEAT RING AND THE SEAT ATTACHMENT ASSEMBLY. HOSE AND PUMPER OUTLET THREADS SHALL BE NATIONAL STANDARD FIRE HYDRANT THREADS. ALL OUTLETS SHALL BE CAPPED, NO CAP RETAINING CHAINS ARE REQUIRED AND THEY ARE TO BE REMOVED IF PRESENT. HYDRANTS MUST INCLUDE CAST OR DUCTILE EPOXY LINED SHOE, RUBBER DRAIN SEALS AND POSITIVE PROTECTIVE VALVE STOP DEVICE. HYDRANTS SHALL OPEN LEFT AN HAVE A 6" MECHANICAL JOINT ELBOW.

HYDRANT BARREL SHALL BE OF SUFFICIENT LENGTH TO PERMIT MINIMUM BURY OF 3 FEET. HYDRANT CAP AND STUFFING BIX SHALL BE ONE PIECE DESIGN, CREATING WATERTIGHT DESIGN WITHOUT USE OF GASKETS, AND SHALL BE EQUIPPED WITH LUBRICATION PORT FOR PERIODIC LUBRICATION OF OPERATING THREADS. OPERATING CAP SHALL BE ONE-PIECE BRONZE CONSTRUCTION, WITH A THRUST WASHER BETWEEN OPERATING NUT AND STEM LOCK NUT. MAIN VALVE SHALL BE OF SYNTHETIC RUBBER REINFORCED WITH STEEL, WITH BRONZE RING SEAT THREADED INTO THE BRONZE HYDRANT SHOE WITH "O"-RINGS TO SEAL DRAIN AND BARREL FROM SHOE WATER LEAKAGE. THE HYDRANT DRAIN HOLE SHALL MOMENTARILY FORCE FLUSH WITH EACH OPERATION. HYDRANTS SHALL BE MUELLER COMPANY - SUPER CENTURION, AMERICAN FLOW CONTROL - B-84-B, CLOW - MEDALLION, KENNEDY - GUARDIAN, OR APPROVED EQUAL. PAINT FIRE HYDRANTS WITH DAVIS PAINT COMPANY CITY OF LYNCHBURG LIME GREEN ENAMEL (DUPONT NO. 7744-D), INTERIOR COATING TO BE IN ACCORDANCE WITH AWWA C550. HYDRANTS WITH A WORKING PRESSURE GREATER THAN 100 PSI SHALL HAVE THE 2-1/2 INCH HOSE NOZZLES PAINTED BLACK.

2.11 BLOW-OFF ASSEMBLIES SHALL BE A MODIFIED VERSION OF THE AQUARIUS MULTI-PURPOSE HYDRANT AS MANUFACTURED BY GIL INDUSTRIES, INC. THE HYDRANT SHALL CONSIST OF A REMOVABLE UPPER UNIT AND A STATIONARY LOWER UNIT INSTALLED IN A DFW PLASTIC WATER METER BOX WITH A FORD A32-LL LID. THE LOWER UNIT SHALL BE MODIFIED BY THE MANUFACTURER TO HAVE A BRONZE BODY BALL VALVE WITH CHROME PLATED BALL AND AUTOMATIC WEEP. THE STANDARD EVACUATION TUBE ARRANGEMENT SHALL BE DELETED. TEMPORARY BLOWOFFS SHALL USE A 2-INCH BRASS RISER PIPE AND 2-INCH BY 2-1/2 INCH INCREASER WITH NATIONAL STANDARD FIRE HOSE CONNECTION THREADS.

2.12 WATER SERVICES: PIPE FOR WATER SERVICES SHALL BE 3/4 INCH OR 1 INCH TYPE K SOFT COPPER, ASTM B-88, WATER TUBE, FS WW-T-799 (2-INCH AND SMALLER PIPE) (FLARED OR COMPRESSION FIT) AND SHALL BE ONE CONTINUOUS RUN FROM MAIN TO METER WITH NO COUPLINGS OTHER THAN BETWEEN STANDARD LENGTHS OF TUBE. 3/4-INCH THROUGH 2-INCH CORPORATIONS SHALL BE BALL STYLE CORPORATION STOPS, FORD FB-600, MUELLER B-25000, A.Y. MCDONALD 4701B, OR APPROVED EQUAL. 3/4-INCH AND 1-INCH BALL STYLE ANGLE VALVE SHALL BE FORD NO. GA92, MUELLER B-24264, A.Y. MCDONALD 4642BY, OR APPROVED EQUAL. YOKE ELLS SHALL BE FORD L91, MUELLER H-14202, A.Y. MCDONALD 4779Y, OR APPROVED EQUAL. 3/4-INCH EXPANSION WHEELS SHALL BE FORD EC-23, MUELLER H-14234, A.Y. MCDONALD 14-2E, OR APPROVED EQUAL. 1-INCH EXPANSION WHEELS SHALL BE FORD EC-4, OR APPROVED EQUAL. 3/4-INCH THROUGH 2-INCH PACK JOINT COUPLINGS SHALL BE FORD C44, MUELLER H-15403, OR A.Y. MCDONALD 4758-22, OR APPROVED EQUAL. 3/4-INCH YOKE BARS SHALL BE FORD Y-502, MUELLER H-5020, A.Y. MCDONALD 14-2, OR APPROVED EQUAL. 1-INCH YOKE BARS SHALL BE FORD Y504, MUELLER H-5040 OR APPROVED EQUAL.

A. STANDARD METER BOXES SHALL BE 18-INCH DIAMETER BY 24-INCH DEEP (MB-5) AS MANUFACTURED BY DFW PLASTICS, OR APPROVED EQUAL. 18-INCH DIAMETER METER BOX COVERS SHALL BE CAST IRON, FORD NO. A32-LL NON-LOCKING, WITH LIFTER BAR OR APPROVED EQUAL. LARGER METERS SHALL BE SET IN 24-INCH OR 30-INCH DIAMETER BY 30-INCH DEEP PLASTIC METER BOXES, WITH FORD EXT-1, OR FORD EXT-3 CAST IRON COVERS OR APPROVED EQUAL. ALL CAST IRON COVERS SHALL BE PAINTED WITH TWO COATS OF FLAT BLACK PAINT.

B. THE CONTRACTOR SHALL RESET THE EXISTING METER FROM THE OLD SERVICE TO THE NEW SERVICE.

C. DIELECTRIC BUSHINGS SHALL BE USED WHEN CONNECTING NEW WATER SERVICES TO EXISTING WATER SERVICES OF DISSIMILAR METALS.

3. EXECUTION

3.01 PIPE LAYING

A. TAKE ALL PRECAUTIONS NECESSARY TO INSURE THAT PIPE, VALVES, FITTINGS, AND ACCESSORIES, INCLUDING SURFACE COATINGS ARE NOT DAMAGED IN UNLOADING, HANDLING, AND PLACING IN TRENCH. EXAMINE EACH PIECE OF MATERIAL JUST PRIOR TO INSTALLATION TO DETERMINE THAT NO DAMAGE HAS OCCURRED. REMOVE ANY DAMAGED MATERIAL FROM THE SITE AND REPLACE WITH UNDAMAGED MATERIAL OR REPAIR DAMAGE PRIOR TO INSTALLATION AS DIRECTED BY THE ENGINEER. ALL PIPE SHALL BE INSTALLED USING APPROVED TOOLS IN ACCORDANCE WITH AWWA STANDARD SPECIFICATION C-600, AND SHALL BE LAID TRUE TO LINE AND GRADE AVOIDING LOCALIZED SAGS OR HIGH POINTS.

B. EXERCISE CARE TO KEEP FOREIGN MATERIAL AND DIRT FROM ENTERING PIPE, FITTINGS, AND VALVES DURING STORAGE, HANDLING, AND PLACING IN TRENCH. CLOSE ENDS OF IN-PLACE PIPE AT THE END OF ANY WORK PERIOD TO PRECLUDE THE ENTRY OF ANIMALS AND FOREIGN MATERIAL. NO MORE THAN 500 FEET OF TRENCH IS TO BE OPEN AT ANY ONE TIME.

C. BEDDING OF PIPE SHALL BE AS SPECIFIED IN SECTION 02220 - TRENCHING AND BACKFILLING. PROVIDE SIX INCHES OF COARSE AGGREGATE FILL AS BEDDING BETWEEN PIPE AND ANY NATURAL ROCK FORMATIONS.

D. DO NOT LAY PIPE WHEN TRENCH BOTTOM IS MUDDY OR FROZEN, OR HAS STANDING WATER.

E. USE ONLY THOSE TOOLS SPECIFICALLY INTENDED FOR CUTTING THE SIZE AND MATERIAL AND TYPE PIPE INVOLVED. MAKE CUT TO PREVENT DAMAGE TO PIPE OR LINING AND TO LEAVE A SMOOTH END AT RIGHT ANGLES TO THE AXIS OF THE PIPE. FLAME CUTTING OR FLAME TAPPING OF DUCTILE IRON AND CAST IRON PIPE WITH AN OXYACETYLENE TORCH WILL NOT BE PERMITTED.

F. LAY PIPE WITH BELL ENDS FACING THE DIRECTION OF LAYING. WHERE GRADE IS 10 PERCENT OR GREATER, LAY PIPE UPHILL WITH BELL ENDS UPGRADE. PROVIDE A MINIMUM OF 36-INCHES OF COVER OVER CROWN OF 8-INCH AND SMALLER MAINS, MAINS 10-INCHES AND LARGER SHALL BE INSTALLED WITH A MINIMUM OF 48-INCHES OF COVER. DEVIATION FROM THESE MINIMUM COVER AMOUNTS MUST BE APPROVED BY THE CITY ENGINEER. HORIZONTAL DEFLECTIONS IN PIPE JOINTS SHALL MEET AWWA C600 STANDARDS, LATEST REVISION.

G. WHERE NONFERROUS METALLIC PIPE (FOR EXAMPLE, COPPER TUBING) CROSSES ANY FERROUS PIPING MATERIAL, MAINTAIN A MINIMUM VERTICAL SEPARATION OF 1 FOOT.

H. THE DEPARTMENT OF PUBLIC WORKS, UTILITIES DIVISION SHALL BE NOTIFIED 48 HOURS IN ADVANCE OF ANY SERVICE OUTAGES, TO ENABLE CITY REPRESENTATIVES 24 HOURS TO NOTIFY AFFECTED SERVICE AREAS OF OUTAGE. UTILITIES DIVISION PERSONNEL SHALL BE THE SOLE OPERATOR OF ALL VALVES AND FIRE HYDRANTS.

I. ASBESTOS CEMENT PIPE MAY BE ENCOUNTERED IN THE CITY'S WATER SYSTEM, THE CONTRACTOR IS RESPONSIBLE FOR ADHERING TO ALL FEDERAL, STATE AND LOCAL REGULATIONS PERTAINING TO MODIFICATIONS, CONNECTIONS, REMOVAL AND DISPOSAL OF ASBESTOS PIPE IF ENCOUNTERED ON THE PROJECT.

J. WATER LINES TO BE ABANDONED ARE TO BE CUT AT THE SOURCE OR AS CLOSE TO THE MAIN AS POSSIBLE, A MINIMUM OF ONE FOOT OF PIPE REMOVED, PLUGGING EACH END AT THE CUT POINT AND/OR SOURCE, ALL VALVES SHALL BE CLOSED

ALONG THE ABANDONED SECTION, AND REMOVING ALL VALVE BOXES TO A DEPTH OF 6-INCHES BELOW GRADE.

3.02 JOINING OF MECHANICAL JOINT PIPE

A. THOROUGHLY CLEAN INSIDE OF THE BELL AND 8 INCHES OF THE OUTSIDE OF THE SPIGOT END OF THE JOINING PIPE TO REMOVE OIL, GRIT, EXCESS COATING, AND OTHER FOREIGN MATTER. PAINT THE BELL AND THE SPIGOT WITH SOAP SOLUTION (HALF CUP GRANULATED SOAP DISSOLVED IN 1 GALLON WATER). SLIP CAST-IRON GLAND ON SPIGOT END WITH LIP EXTENSION OF GLAND TOWARD END OF PIPE. PAINT RUBBER GASKET WITH OR DIP INTO THE SOAP SOLUTION AND PLACE ON THE SPIGOT END WITH THICK EDGE TOWARD THE GLAND.

B. PUSH THE SPIGOT END FORWARD TO SEAT IN THE BELL. THEN PRESS THE GASKET INTO THE BELL SO THAT IT IS LOCATED EVENLY AROUND THE JOINT. MOVE THE GLAND INTO POSITION, INSERT BOLTS, AND SCREW NUTS UP FINGER TIGHT. THEN TIGHTEN ALL NUTS TO TORQUE LISTED BELOW:

BOLT SIZE - INCHES	TORQUE FEET - POUNDS
5/8	45 - 60
3/4	75 - 90
1	100 - 120
1-1/4	120 - 150

TIGHTEN NUTS ON ALTERNATE SIDE OF THE GLAND UNTIL PRESSURE ON THE GLAND IS EQUALLY DISTRIBUTED, IN ACCORDANCE WITH AWWA C600.

C. JOIN LOCK-TYPE MECHANICAL JOINT PIPE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

D. PERMISSIBLE DEFLECTION IN MECHANICAL JOINT PIPE SHALL NOT BE GREATER THAN LISTED IN AWWA C600.

E. PERMISSIBLE DEFLECTION IN LOCK-TYPE MECHANICAL JOINT PIPE SHALL BE AS RECOMMENDED BY MANUFACTURER.

3.03 JOINING OF PUSH-ON JOINT PIPE

A. THOROUGHLY CLEAN INSIDE OF THE BELL AND 8 INCHES OF THE OUTSIDE OF SPIGOT END OF THE JOINING PIPE TO REMOVE OIL, GRIT, EXCESS COATING, AND OTHER FOREIGN MATTER WHICH MAY INTERFERE WITH GASKET SEATING. FLEX RUBBER GASKET AND INSERT IN THE GASKET RECESS OF THE BELL SOCKET. APPLY A THIN FILM OF GASKET LUBRICANT SUPPLIED BY PIPE MANUFACTURER TO THE GASKET AND THE PLAIN END OF THE JOINING PIPE. START THE SPIGOT END OF THE PIPE INTO THE SOCKET WITH CARE USING A BLADE TYPE FEELER GAUGE TO CONFIRM GASKET ALIGNMENT, THEN HOME THE JOINT TO THE ALIGNMENT STRIPE BY PRESSING THE PLAIN END TO THE BOTTOM OF THE SOCKET WITH A FORKED TOOL OR JACK-TYPE DEVICE. FILE OR GRIND THE END OF ANY FIELD CUT PIPE TO MATCH THE MANUFACTURED SPIGOT END.

B. JOIN RESTRAINED PUSH-ON JOINTS ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

C. PERMISSIBLE DEFLECTION IN PUSH-ON JOINT PIPE SHALL NOT BE GREATER THAN LISTED IN AWWA C600.

D. PERMISSIBLE DEFLECTION IN RESTRAINED PUSH-ON JOINT PIPE SHALL BE AS RECOMMENDED BY MANUFACTURER.

3.04 JOIN COPPER PIPE USING FLARED OR COMPRESSION FITTINGS.

3.05 PROVIDE REACTION ANCHORS OF CONCRETE BLOCKING, METAL TIE ROD RESTRAINTS, RETAINER GLAND TYPE, OR RESTRAINED JOINT TYPE PIPE AT ALL CHANGES IN DIRECTION AND AT ALL DEAD ENDS OF PRESSURE PIPELINES AND AS SHOWN ON DRAWINGS.

A. CONCRETE REACTION ANCHORS SHALL BEAR AGAINST UNDISTURBED EARTH AND SHALL BE OF THE SIZE AND SHAPE SHOWN ON THE DRAWINGS.

B. USE METAL TIE ROD RESTRAINTS AS SHOWN ON DRAWINGS OR IF APPROVED BY THE ENGINEER.

C. WHERE RETAINER GLANDS ARE USED, EXTREME CARE SHALL BE TAKEN SO THAT EACH SET SCREW IS TIGHTENED AS RECOMMENDED BY THE MANUFACTURER BEFORE THE PIPE IS BACKFILLED AND TESTED.

3.06 SETTING OF VALVES AND VALVE BOXES

A. INSTALL VALVES WITH OPERATOR STEMS IN THE VERTICAL PLANE THROUGH THE PIPE AXIS AND PERPENDICULAR TO THE PIPE AXIS. LOCATE VALVES WHERE SHOWN ON DRAWINGS. THOROUGHLY CLEAN BEFORE INSTALLATION. CHECK VALVES FOR SATISFACTORY OPERATION.

B. EQUIP ALL UNDERGROUND VALVE OPERATORS WITH VALVE BOXES. SET BOX IN ALIGNMENT WITH VALVE STEM CENTERED ON VALVE NUT. SET THE VALVE BOX TO PREVENT TRANSMITTING SHOCK OR STRESS TO THE VALVE. SET THE BOX COVER FLUSH WITH THE FINISHED GROUND SURFACE OR PAVEMENT.

C. ALL VALVE BOXES AND MANHOLE FRAMES AND COVERS LOCATED OUT OF THE PAVEMENT OF THE ROAD SHALL BE INSTALLED APPROXIMATELY 1 INCH BELOW THE FINISHED GRADE. WHEN LOCATED IN THE PAVEMENT, THEY SHALL BE PLACED FLUSH WITH THE PAVEMENT SURFACE UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR NOTED ON THE PLANS.

D. ALL VALVE BOX COVERS AND RIMS AND MANHOLE FRAMES AND COVERS LOCATED IN THE SHOULDER OF THE ROAD SHALL BE PAINTED WITH TWO COATS OF BLUE PAINT IN ACCORDANCE WITH RECENTLY ADOPTED STANDARDS OF THE AMERICAN PUBLIC WORKS ASSOCIATION'S UTILITY LOCATION AND COORDINATING COUNCIL.

3.07 INSTALLATION OF TAPPING SLEEVES AND TAPPING VALVES

A. ALL TAPPING SLEEVES SHALL BE SET TO AVOID INTERFERENCE WITH EXISTING PIPE JOINTS. IF THE CONNECTION TO THE EXISTING MAINS REQUIRES A WET TAP, SUCH TAP SHALL BE DONE BY A FIRM EXPERIENCED AND EQUIPPED TO DO THIS TYPE OF WORK. ALL MATERIALS AND LABOR SHALL BE PROVIDED BY THE CONTRACTOR TO INCLUDE, BUT NOT NECESSARY LIMITED TO THE SLEEVE, VALVE, TAPPING MACHINE, ACCESSORIES, INSTALLATION, AND TESTING OF SUCH MATERIALS TO COMPLETE THE WORK. THE UTILITIES ENGINEER SHALL HAVE THE RIGHT TO ACCEPT OR REJECT THE FIRM OR CREW PERFORMING THE WORK.

B. AFTER ALL TAPPING SLEEVES AND VALVES HAVE BEEN SET IN PLACE, A PRESSURE TEST OF 150 PSI SHALL BE MADE TO INSURE THAT THERE ARE NO

LEAKS AROUND THE SLEEVE OR THROUGH THE VALVE PRIOR TO TAPPING. ALL LEAKAGE SHALL BE CORRECTED.

C. ALL WET TAPS SHALL BE SCHEDULED AT LEAST 5 WORKING DAYS IN ADVANCE AND A UTILITIES DIVISION INSPECTOR SHALL BE PRESENT DURING ALL PHASES OF TAPPING OPERATIONS.

3.08 LOCATE FIRE HYDRANTS AT SUCH A DISTANCE FROM THE CURB OR EDGE OF PAVEMENT TO PROVIDE READY ACCESS AND MINIMIZE THE POSSIBILITY OF DAMAGE FROM VEHICLES. ORIENT THE HYDRANT SO THAT THE PUMPER NOZZLE FACES THE PAVEMENT, INSTALL THE HYDRANT VALVE AS CLOSE TO THE MAIN AS POSSIBLE. IN AREAS WHERE THE HYDRANT IS SET BEHIND GUARDRAIL, INSTALL THE HYDRANT WITH THE CENTER OF THE PUMPER CONNECTION A MINIMUM OF 12-INCHES ABOVE THE GUARDRAIL. SET HYDRANT PLUMB AND WITH THE BREAKAWAY FLANGE ON THE HYDRANT 2-INCHES ABOVE GRADE. PROVIDE ANCHORAGE AND AT LEAST 0.5 CUBIC YARDS OF COARSE AGGREGATE UNDER THE BASE TO ALLOW DRAINAGE FROM THE HYDRANT DRAIN VALVE, AS SHOWN ON STANDARD DETAILS. ALL HYDRANTS SHALL BE SET ON A CONCRETE PAD, AND PAINTED IN ACCORDANCE WITH STANDARD DETAILS. PLACE FABRIC BAG OR OUT OF SERVICE RING OVER PUMPER NOZZLE OF ALL HYDRANTS WHICH ARE NOT OPERATIVE. HYDRANTS SHALL REMAIN OUT OF SERVICE UNTIL THEY ARE GREASED, AND INDIVIDUALLY OPERATED IN THE PRESENCE OF THE CITY INSPECTOR, AND FORMALLY ACCEPTED BY THE CITY.

3.09 BLOW-OFF ASSEMBLIES SHALL BE CONNECTED TO WATERLINES BY INSTALLING AN 8-INCH CAP OR PLUG TAPPED 2 INCHES, 2-INCH THREADED BRASS NIPPLES, AND A 2-INCH BRASS UNIT. THE 8-INCH CAP OR PLUG SHALL BE TIE-RODDED TO AN END OF LINE CONCRETE RESTRAINING ANCHOR. ONE CUBIC FOOT OF NO. 57 STONE SHALL BE PLACED AROUND THE BALL VALVE AT THE BASE OF THE BLOW-OFF HYDRANT. A WATER METER BOX SHALL BE INSTALLED AROUND THE STATIONARY LOWER UNIT OF THE BLOW-OFF HYDRANT, PRICE FOR BLOW OFF HYDRANT ASSEMBLY SHALL INCLUDE ALL OF THESE MATERIALS, AND LABOR TO INSTALL THE COMPLETE ASSEMBLY AS SHOWN ON STANDARD DETAILS.

3.10 WATER SERVICES SHALL BE ABANDONED BY CLOSING THE CORPORATION STOP AT THE WATER MAIN AND CRIMPING OFF THE WATER SERVICE BETWEEN THE WATER MAIN AND THE WATER METER 1 FOOT FROM THE CORPORATION STOP.

3.11 ACCEPTANCE TESTS

A. AFTER THE LINE HAS BEEN BACKFILLED AND AT LEAST 7 DAYS AFTER THE LAST CONCRETE REACTION ANCHOR HAS BEEN POURED, (IF TESTING WITHIN SEVEN DAYS, USE HIGH EARLY STRENGTH CONCRETE), SUBJECT THE LINE AND EACH VALVED SECTION OF THE LINE, INCLUDING SERVICE LINES AND FITTINGS, TO A HYDROSTATIC PRESSURE TEST. INTERMEDIATE VALVED SECTIONS SHALL BE TESTED SEPARATELY. FILL THE SYSTEM WITH WATER AT A VELOCITY OF APPROXIMATELY 1 FOOT PER SECOND WHILE NECESSARY MEASURES ARE TAKEN TO ELIMINATE ALL AIR. AFTER THE SYSTEM HAS BEEN FILLED, RAISE THE PRESSURE BY PUMP TO 150 PSI OR 1.5 TIMES THE STATIC PRESSURE, WHICHEVER IS GREATER. TEST PRESSURES SHALL: (1) NOT BE LESS THAN 1.25 TIMES THE WORKING PRESSURE AT THE HIGHEST POINT ALONG THE TEST SECTION; (2) NOT EXCEED THRUST RESTRAINT PRESSURES; (3) NOT VARY BY MORE THAN PLUS OR MINUS 5 PSI; (4) NOT EXCEED TWICE THE RATED PRESSURE OF THE VALVES OR HYDRANTS WHEN TEST INCLUDES CLOSED GATE VALVES; AND (5) NOT EXCEED RATED PRESSURE OF VALVES IF RESILIENT-SEATED BUTTERFLY VALVES ARE USED. MEASURE PRESSURE AT THE LOW POINT ON THE SYSTEM COMPENSATING FOR GAGE ELEVATION. MAINTAIN THIS PRESSURE FOR 2 HOURS. IF PRESSURE CANNOT BE MAINTAINED, DETERMINE CAUSE, REPAIR, AND REPEAT THE TEST UNTIL SUCCESSFUL.

B. A LEAKAGE TEST SHALL BE CONDUCTED CONCURRENTLY WITH THE PRESSURE TEST. LEAKAGE SHALL BE DETERMINED WITH A CALIBRATED TEST METER FURNISHED BY THE CONTRACTOR. LEAKAGE WILL BE DEFINED AS THE QUANTITY OF WATER REQUIRED TO BE SUPPLIED TO MAINTAIN A PRESSURE WITHIN 5 PSI OF THE SPECIFIED TEST PRESSURE, AFTER AIR HAS BEEN EXPELLED, AND THE PIPE FILLED WITH WATER. LEAKAGE SHALL NOT EXCEED THAT QUANTITY OBTAINED BY THE FORMULA BELOW OR AS LISTED IN TABLE 6A OF AWWA STANDARD C600, SECTION 5.2. IF LEAKAGE EXCEEDS THAT DETERMINED BY THE FORMULA, FIND AND REPAIR THE LEAKS AND REPEAT THE TEST UNTIL SUCCESSFUL. THE LEAKAGE FORMULA SHALL BE AS FOLLOWS:

FOR ALL TYPES L EQUALS SD (SQUARE ROOT OF P)/133,200
EXCEPT WELDED STEEL

WHERE L EQUALS ALLOWABLE LEAKAGE IN GALLONS/HOUR
S EQUALS LENGTH OF PIPELINE TESTED IN FEET
D EQUALS NOMINAL DIAMETER OF THE PIPE IN INCHES
P EQUALS AVERAGE TEST PRESSURE DURING LEAKAGE TEST IN PSIG

C. ALL VISIBLE LEAKS SHALL BE REPAIRED REGARDLESS OF THE AMOUNT OF LEAKAGE. NO LEAKAGE WILL BE ALLOWED IN WELDED STEEL PIPE, ALL LEAKS IN WELDED STEEL PIPE SHALL BE REPAIRED BY WELDING, PEENING WILL NOT BE ALLOWED.

D. CONTRACTOR SHALL PROVIDE TEMPORARY AIR BLEED OFF FITTINGS AS REQUIRED. ALL COSTS TO EXCAVATE, REPAIR, RESTORE AND RE-TEST LINE SEGMENTS WILL BE AT CONTRACTOR EXPENSE.

3.12 DISINFECT AND TEST WATER MAINS, SERVICE LINES, AND ACCESSORIES IN ACCORDANCE WITH AWWA C-651, FOLLOWING THE PROCEDURES LISTED BELOW AND MEET REQUIREMENTS OF ALL AUTHORITIES HAVING JURISDICTION.

A. PRELIMINARY FLUSHING: THE MAIN SHALL BE FLUSHED PRIOR TO DISINFECTION, EXCEPT WHEN THE TABLET METHOD IS USED. FLUSHING SHALL BE AT A VELOCITY OF NOT LESS THAN 2.5 FEET PER SECOND. ADEQUATE PROVISIONS SHALL BE MADE FOR DRAINAGE OF FLUSHING WATER IN COMPLIANCE WITH WATER QUALITY AND EROSION CONTROL STANDARDS.

B. FORM OF CHLORINE FOR DISINFECTION

(1) LIQUID CHLORINE SHALL NOT BE PERMITTED.

(2) CALCIUM HYPOCHLORITE CONTAINS 65 PERCENT AVAILABLE CHLORINE BY WEIGHT. IT SHALL BE EITHER GRANULAR OR TABULAR IN FORM. THE TABLETS, SIX TO EIGHT TO THE OUNCE, ARE DESIGNED TO DISSOLVE SLOWLY IN WATER. A CHLORINE-WATER SOLUTION SHALL BE PREPARED BY DISSOLVING THE GRANULES OR TABLETS IN WATER IN THE PROPORTION REQUISITE FOR THE DESIRED CONCENTRATION.

(3) SODIUM HYPOCHLORITE IS SUPPLIED IN STRENGTHS FROM 5.25 TO 16 PERCENT AVAILABLE CHLORINE. THE CHLORINE-WATER SOLUTION SHALL BE PREPARED BY ADDING HYPOCHLORITE TO WATER. PRODUCT DETERIORATION SHALL BE ACCOUNTED FOR IN COMPUTING THE QUANTITY OF SODIUM HYPOCHLORITE REQUIRED FOR THE DESIRED CONCENTRATION.

(4) APPLICATION: THE HYPOCHLORITE SOLUTIONS SHALL BE APPLIED TO THE WATER MAIN WITH A GASOLINE OR ELECTRICALLY-POWERED CHEMICAL FEED PUMP DESIGNED FOR FEEDING CHLORINE SOLUTIONS. FOR SMALL

APPLICATIONS, THE SOLUTIONS MAY BE FED WITH A HAND PUMP; FOR EXAMPLE, A HYDRAULIC TEST PUMP. FEED LINES SHALL BE OF SUCH MATERIAL AND STRENGTH AS TO WITHSTAND SAFELY THE MAXIMUM PRESSURES THAT MAY BE CREATED BY THE PUMPS. ALL CONNECTIONS SHALL BE CHECKED FOR TIGHTNESS BEFORE THE HYPOCHLORITE SOLUTION IS APPLIED TO THE MAIN.

C. METHODS OF CHLORINE APPLICATION

(1) CONTINUOUS FEED METHOD: WATER FROM THE EXISTING DISTRIBUTION SYSTEM OR OTHER APPROVED SOURCES OF SUPPLY SHALL BE MADE TO FLOW AT A CONSTANT, MEASURED RATE INTO THE NEWLY-LAID PIPELINE. THE WATER SHALL RECEIVE A DOSE OF CHLORINE, ALSO FED AT A CONSTANT, MEASURED RATE. THE TWO RATES SHALL BE PROPORTIONED SO THAT THE CHLORINE CONCENTRATION IN THE WATER IN THE PIPE IS MAINTAINED AT A MINIMUM OF 50 MG/L AVAILABLE CHLORINE. TO ASSURE THAT THIS CONCENTRATION IS MAINTAINED, THE CHLORINE SHALL BE MEASURED AT INTERVALS NOT EXCEEDING 2,000 FEET IN ACCORDANCE WITH THE PROCEDURES DESCRIBED IN THE CURRENT EDITION OF "STANDARD METHODS" AND AWWA M12 - "SIMPLIFIED PROCEDURES FOR WATER EXAMINATION." IN THE ABSENCE OF A METER, THE RATE MAY BE DETERMINED EITHER BY PLACING A PITOT GAGE AT THE DISCHARGE OR BY MEASURING THE TIME TO FILL A CONTAINER OF KNOWN VOLUME. TABLE 1 GIVES THE AMOUNT OF CHLORINE REQUIRED FOR EACH 100 FEET OF PIPE OF VARIOUS DIAMETERS. SOLUTIONS OF 1 PERCENT CHLORINE MAY BE PREPARED WITH SODIUM HYPOCHLORITE OR CALCIUM HYPOCHLORITE. THE LATTER SOLUTION REQUIRES APPROXIMATELY 1 POUND OF CALCIUM HYPOCHLORITE IN 8.5 GALLONS OF WATER.

TABLE 1
CHLORINE REQUIRED TO PRODUCE 50 MG/L CONCENTRATION
IN 100 FEET OF PIPE - BY DIAMETER

PIPE SIZE INCHES	100 PERCENT CHLORINE POUNDS	1 PERCENT CHLORINE SOLUTIONS GALLONS
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88
16	0.430	5.12
20	0.675	8.00
24	0.972	11.50
30	1.500	18.01
36	2.187	25.92
42	2.977	35.28

DURING THE APPLICATION OF THE CHLORINE, VALVES SHALL BE MANIPULATED TO PREVENT THE TREATMENT DOSAGE FROM FLOWING BACK INTO THE LINE SUPPLYING THE WATER. CHLORINE APPLICATION SHALL NOT CEASE UNTIL THE ENTIRE MAIN IS FILLED WITH THE CHLORINE SOLUTION. THE CHLORINATED WATER SHALL BE RETAINED IN THE MAIN FOR AT LEAST 24 HOURS, DURING WHICH TIME ALL VALVES AND HYDRANTS IN THE SECTION TREATED SHALL BE OPERATED IN ORDER TO DISINFECT THE APPURTENANCES. AT THE END OF THIS 24-HOUR PERIOD, THE TREATED WATER SHALL CONTAIN NO LESS THAN 10 MG/L CHLORINE THROUGHOUT THE LENGTH OF THE MAIN.

(2) SLUG METHOD (USE ONLY IF AUTHORIZED BY UTILITIES DEPARTMENT): WATER FROM THE EXISTING DISTRIBUTION SYSTEM OR OTHER APPROVED SOURCE OF SUPPLY SHALL BE MADE TO FLOW AT A CONSTANT, MEASURED RATE INTO THE NEWLY LAID PIPELINE. THE WATER SHALL RECEIVE A DOSE OF CHLORINE, ALSO FED AT A CONSTANT, MEASURED RATE. THE TWO RATES SHALL BE PROPORTIONED SO THAT THE CONCENTRATION IN THE WATER ENTERING THE PIPELINE IS MAINTAINED AT NO LESS THAN 300 MG/L. THE CHLORINE SHALL BE APPLIED CONTINUOUSLY AND FOR A SUFFICIENT PERIOD TO DEVELOP A SOLID COLUMN OR "SLUG" OF CHLORINATED WATER THAT WILL, AS IT PASSES ALONG THE LINE, EXPOSE ALL INTERIOR SURFACES TO A CONCENTRATION OF AT LEAST 100 MG/L FOR AT LEAST 3 HOURS. ALL INTERMEDIATE APPURTENANCES SHALL BE OPERATED AS THE SLUG PASSES TO ENSURE ADEQUATE DISINFECTION OF ALL INTERIOR SURFACES. THE APPLICATION SHALL BE CHECKED AT REGULAR INTERVALS AS DETERMINED BY THE CITY INSPECTOR BUT NOT MORE THAN 2,000 FEET BETWEEN TEST POINTS, TO ENSURE THAT ADEQUATE RESIDUAL IS MAINTAINED IN THE LINE.

AS THE CHLORINATED WATER FLOWS PAST TEES AND CROSSES, RELATED VALVES AND HYDRANTS SHALL BE OPERATED SO AS TO DISINFECT APPURTENANCES.

(3) TABLET METHOD: USE ONLY WHEN SCRUPULOUS CLEANLINESS HAS BEEN EXERCISED BECAUSE PRELIMINARY FLUSHING CANNOT BE USED. DO NOT USE THIS METHOD IF TRENCH WATER OR FOREIGN MATERIAL HAS ENTERED THE MAIN OR IF THE WATER IS BELOW 41 DEGREES F (5 DEGREES C). THIS METHOD MAY BE USED FOR MAINS UP TO 12 INCHES IN DIAMETER AND WHERE THE TOTAL LENGTH OF THE MAIN IS LESS THAN 2,500 FEET.

PLACE TABLETS IN EACH SECTION OF PIPE AND ALSO IN HYDRANTS, HYDRANT BRANCHES, AND OTHER APPURTENANCES. ENOUGH TABLETS SHALL BE USED TO ENSURE THAT A CHLORINE CONCENTRATION OF 25 MG/L IS PROVIDED IN THE WATER. ATTACH TABLETS USING PERMATEX NO. 1 ADHESIVE OR OTHER ADHESIVE APPROVED BY THE ENGINEER, EXCEPT FOR THE TABLETS PLACED IN HYDRANTS AND IN THE JOINTS BETWEEN THE PIPE SECTIONS. TABLETS SHALL BE FREE OF ADHESIVE EXCEPT ON THE ONE BROAD SIDE TO BE ATTACHED. PLACE ALL TABLETS AT THE TOP OF THE MAIN. IF THE TABLETS ARE ATTACHED BEFORE THE PIPE SECTION IS PLACED IN THE TRENCH, MARK THE POSITION OF THE TABLET IN THE PIPE AND ASSURE THAT THE PIPE IS PLACED WITH THE TABLET AT THE TOP.

THE FOLLOWING TABLE SHOWS THE NUMBER OF 5 GRAIN HTH TABLETS NECESSARY PER JOINT OF PIPE TO OBTAIN 50 PPM CHLORINE.

PIPE SIZE	TABLETS PER JOINT
3 INCH	1
4 INCH	1
6 INCH	2
8 INCH	3
10 INCH	4
12 INCH	7

WHEN INSTALLATION IS COMPLETED, FILL THE MAIN WITH WATER AT A VELOCITY OF LESS THAN 1-FOOT PER SECOND. THE WATER SHALL REMAIN IN THE PIPE FOR AT LEAST 24 HOURS. OPERATE VALVES SO THAT THE STRONG CHLORINE SOLUTION WILL NOT FLOW BACK INTO THE

LINE SUPPLYING THE WATER AND TO ENSURE THAT ALL INTERMEDIATE VALVES AND APPURTENANCES ARE DISINFECTED.

D. FINAL FLUSHING: AFTER THE APPLICABLE RETENTION PERIOD, THE HEAVILY CHLORINATED WATER SHALL BE FLUSHED FROM THE MAIN AND SERVICE LINES UNTIL THE CHLORINE CONCENTRATION IN THE WATER LEAVING THE MAIN IS NO HIGHER THAN THAT GENERALLY PREVAILING IN THE SYSTEM, OR LESS THAN 1 MG/L. CHLORINE RESIDUAL DETERMINATION SHALL BE MADE TO ASCERTAIN THAT THE HEAVILY CHLORINATED WATER HAS BEEN REMOVED FROM THE PIPELINE. THE CONTRACTOR SHALL IMPLEMENT MEASURES TO CONTROL THE DISCHARGE OF SUPER-CHLORINATED WATER TO AVOID VIOLATIONS OF WATER QUALITY STANDARDS. SPECIFIC DECHLORINATION PROCEDURES MAY BE REQUIRED AT THE DISCRETION OF THE CITY ENGINEER.

E. BACTERIOLOGIC TESTS: AFTER FINAL FLUSHING AND BEFORE THE WATER MAIN IS PLACED IN SERVICE, A SAMPLE OR SAMPLES SHALL BE COLLECTED AT REGULAR INTERVALS NOT EXCEEDING 2,000 FEET AND TESTED FOR BACTERIOLOGIC QUALITY AND SHALL SHOW THE ABSENCE OF COLIFORM ORGANISMS IN ACCORDANCE WITH SECTION 5 OF AWWA STANDARD C651. THE CONTRACTOR SHALL INSTALL A SAMPLING TAP CONSISTING OF A CORPORATION STOP AND CURB COCK INSTALLED IN THE PIPE WITH A COPPER GOOSENECK ASSEMBLY. AT LEAST TWO SAMPLES WILL BE COLLECTED BY THE CITY AT LEAST 24 HOURS APART AND TESTED BY THE CITY UTILITY DIVISION.

(1) SAMPLES FOR BACTERIOLOGICAL ANALYSIS SHALL BE COLLECTED IN STERILE BOTTLES TREATED WITH SODIUM THIOSULFATE. IF LABORATORY RESULTS INDICATE THE PRESENCE OF COLIFORM BACTERIA, THE SAMPLES ARE UNSATISFACTORY. THE DISINFECTION SHALL BE REPEATED UNTIL THE SAMPLES ARE SATISFACTORY. THE TABLET METHOD CANNOT BE USED IN REPEATED DISINFECTIONS. CLEANING AND DISINFECTION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. WATER FOR THESE OPERATIONS WILL BE FURNISHED BY THE OWNER BUT THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOADING, HAULING, AND DISCHARGING OF WATER.

F. REPAIRS: CLEANING, DISINFECTING, FLUSHING, TESTING, OR SIMILAR OPERATIONAL ACTIONS SHALL BE IN ACCORDANCE WITH THE CURRENT STANDARD ISSUED BY AWWA (AWWA C-651).

G. CLEANING, DISINFECTION, AND TESTING WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. WATER FOR THESE OPERATIONS WILL BE FURNISHED BY THE OWNER, BUT THE CONTRACTOR SHALL INCLUDE IN HIS BID THE COST OF LOADING, HAULING, AND DISCHARGING THE WATER.

H. TESTING AND DISINFECTION OF THE COMPLETED SECTIONS SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO REPAIR OR REPLACE ANY CRACKED OR DEFECTIVE PIPE. ALL WORK NECESSARY TO SECURE A TIGHT LINE SHALL BE DONE AT THE CONTRACTOR'S EXPENSE.

I. PIPE SUBJECTED TO CONTAMINATION OR CONTAMINATING MATERIALS SHALL BE TREATED AS DIRECTED BY THE CITY ENGINEER. SHOULD SUCH TREATMENT FAIL TO CLEANSE THE PIPE, REPLACEMENT SHALL BE REQUIRED. THE CITY OF LYNCHBURG SHALL BEAR NO PORTION OF ANY COST SUSTAINED BY THE CONTRACTOR MEETING THIS SPECIFICATION.

J. SERVICE CONNECTIONS SHALL BE INCLUDED IN THE MAIN LINE DISINFECTION PROCESS. THE CONTRACTOR SHALL HAVE THE SAME RESPONSIBILITY FOR SERVICE LATERALS AS FOR THE MAINS IN REGARDS TO BEARING FULL COST FOR ANY CORRECTIVE MEASURES NEEDED TO COMPLY WITH EITHER THE BACTERIOLOGICAL TEST OR OTHER SUCH REQUIREMENTS.

END OF SECTION

SECTION 02720 - STORM SEWER SYSTEMS

1. GENERAL

1.01 SYSTEM DESCRIPTION: WORK IN THIS SECTION INCLUDES ALL STORM DRAINAGE WORK ON THIS PROJECT.

1.02 REFERENCE SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS.....ASTM

B. VIRGINIA DEPARTMENT OF TRANSPORTATION.....VDOT

1.03 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN SECTION 01000 - GENERAL REQUIREMENTS.

A. SHOP DRAWINGS OF THE FOLLOWING:

(1) MANHOLE RISER SECTIONS AND TOPS

(2) MANHOLE FRAMES AND COVERS

(3) INLET STRUCTURES AND RELATED APPURTENANCES

(5) PIPE, TEES AND PIPING SPECIALS

B. SUBMITTAL: LAY SCHEDULE FOR THOMAS ROAD CULVERT REPLACEMENT

2. PRODUCTS

2.01 REINFORCED CONCRETE PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ASTM C 76, "REINFORCED CONCRETE CULVERT, STORM DRAIN, AND SEWER PIPE," FOR CLASS OF PIPE AS INDICATED ON THE DRAWINGS. PIPE SHALL BE MARKED WITH CLASS AND MANUFACTURER'S NAME.

2.02 NON-REINFORCED CONCRETE PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ASTM C 14, "CONCRETE SEWER, STORM DRAIN, AND CULVERT PIPE," CLASS III, B-WALL PIPE. PIPE SHALL BE MARKED WITH CLASS AND MANUFACTURER'S NAME. PLAIN CONCRETE PIPE IS APPROVED FOR STORM USES IN NON-TRAFFIC BEARING SITUATIONS ONLY.

2.03 CONCRETE PIPE JOINTS SHALL BE TONGUE AND GROOVE TYPE. PIPE USED FOR EXTENDED DETENTION PONDS, CULVERTS, AND STORM LINES OVER 60 INCHES IN DIAMETER SHALL HAVE "O" RING GROOVES AND BE INSTALLED WITH RUBBER GASKETS MEETING ASTM C443.

2.04 MANHOLES SHALL BE OF PRECAST CONCRETE MANHOLE RISERS WITH SEALED JOINTS AND MONOLITHIC PRECAST BOTTOMS UNLESS INDICATED OTHERWISE ON DRAWINGS. PRECAST CONCRETE MANHOLE RISERS SHALL BE IN ACCORDANCE WITH ASTM C 478, "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS." MINIMUM DIAMETER SHALL BE 48-INCHES, WALL THICKNESS SHALL BE A MINIMUM OF 5-INCHES THICK AND HAVE A 6-INCH MINIMUM EXTENDED BASE. MANHOLE STEPS ARE NOT PERMITTED. MANHOLES OVER 12 FEET DEEP SHALL HAVE 12-INCH EXTENDED BASES WITH APPROPRIATE REINFORCING. THE PIPE OPENING IN PRECAST UNITS SHALL BE AT LEAST 4 BUT NOT MORE THAN 8 INCHES LARGER THAN THE OUTSIDE DIAMETER OF THE PIPE. PIPE OPENINGS SHALL BE FORMED, DRILLED, OR NEATLY CUT AS APPROVED BY THE ENGINEER.

A. STANDARD FRAMES AND COVERS: MANHOLE FRAMES AND COVERS SHALL BE MANUFACTURED FROM CLASS 30 GRAY IRON, MEETING THE REQUIREMENTS OF ASTM A48, STANDARD SPECIFICATION FOR GRAY IRON CASTINGS. STANDARD MANHOLE FRAMES AND COVERS SHALL BE MANUFACTURED TO THE DIMENSIONS AND CONFIGURATIONS SHOWN ON STANDARD DETAILS AND SHALL HAVE A MINIMUM OF 4 1-INCH DIAMETER MOUNTING HOLES IN THE FLANGE OF THE FRAME. MINIMUM INSIDE DIAMETER OF THE OPENING SHALL BE 24 INCHES. MANHOLES CASTINGS MAY BE EITHER BITUMINOUS COATED OR PLAIN. THE BEARING SURFACE OF THE FRAMES AND COVERS SHALL BE MACHINED AND THE COVER SHALL SEAT FIRMLY INTO THE FRAME WITHOUT ROCKING. COVERS ARE TO BE EMBOSSED ALONG THE PERIMETER WITH THE WORDS "STORM." APPROVED CASTINGS ARE THE US FOUNDRY 710 RING AND DP COVER, EAST JORDAN IRON WORKS 2027 FRAME AND COVER, OR APPROVED EQUAL. ALL CASTINGS ARE TO BE MADE IN THE U.S.A. A VULCAN V-1883 FRAME AND COVER IS TO BE USED WITH FLAT TOP MANHOLE STRUCTURES.

2.05 INLETS, ENDWALLS, AND OTHER STORM DRAINAGE ITEMS SHALL BE PRECAST REINFORCED CONCRETE IN ACCORDANCE WITH THE LATEST EDITION OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT) "ROAD AND BRIDGE STANDARDS."

2.06 DUCTILE IRON PIPE SHALL BE MEET AWWA C151 AND ASTM A746, STANDARD SPECIFICATION FOR DUCTILE IRON GRAVITY SEWER PIPE FOR 4-INCH AND LARGER DIAMETER PIPE, THICKNESS CLASS RATED, CLASS 50 MINIMUM. THE THICKNESS OF DUCTILE IRON PIPE SHALL BE DETERMINED BY CONSIDERING TRENCH LOAD IN ACCORDANCE WITH AWWA C150. THE DUCTILE IRON PIPE SHALL BE CEMENT MORTAR LINED WITH A SEAL COAT IN ACCORDANCE WITH AWWA C104. OUTSIDE COAT SHALL BE A MINIMUM OF 1 MIL BITUMINOUS PAINT ACCORDING TO ANSI/AWWA C151/A21.21 SECTION 51-8.1. DUCTILE IRON PIPE USED FOR STORM SEWERS SHALL BE MARKED WITH WEIGHT, CLASS OR THICKNESS, LETTERS "DI" OR "DUCTILE", MANUFACTURERS MARK, YEAR PIPE WAS MADE AND CASTING PERIOD. PUSH-ON AND MECHANICAL JOINT PIPE SHALL BE AS MANUFACTURED BY THE AMERICAN CAST IRON PIPE COMPANY, UNITED STATES PIPE AND FOUNDRY COMPANY, GRIFFIN PIPE PRODUCTS COMPANY, OR MCWANE CAST IRON PIPE COMPANY.

2.07 CONCRETE BLOCK USED FOR CONSTRUCTION OF CATCH BASINS SHALL MEET REQUIREMENTS OF ASTM C139. BRICK USED TO CONSTRUCT STORM APPURTENANCES SHALL MEET ASTM C32 STANDARDS FOR SEWER AND MANHOLE BRICK. MORTAR SHALL BE TYPE M, MEETING ASTM C-270, AND ASTM C-144, MORTAR SHALL BE MIXED IN CLEAN CONTAINERS ON A 1 PART PORTLAND CEMENT TO 2 PARTS SAND RATIO AS IT IS NEEDED AND SHALL NOT BE USED IF IT HAS BEEN MIXED FOR OVER 45 MINUTES. PORTLAND CEMENT SHALL BE TYPE I, CSA NORMAL, MEETING ASTM C150.

2.08 ALL CONCRETE FOR CAST-IN-PLACE STRUCTURES SHALL BE A3 CONCRETE, MEETING ASTM C94 STANDARDS FOR READY MIXED CONCRETE UNLESS OTHERWISE DIRECTED.

3. EXECUTION

3.01 MAINTAIN DRAINAGE ON SITE TO PREVENT EROSION, DAMAGING WATER, AND STANDING WATER DURING ALL PHASES OF CONSTRUCTION.

3.02 KEEP EXCAVATIONS CLEAR OF WATER WHILE WORK IS BEING INSTALLED. CONTROL SUBSURFACE WATER ENCOUNTERED AND REPORT TO THE ENGINEER.

3.03 BED PIPE AS SPECIFIED IN SECTION 02220 - TRENCHING AND BACKFILLING.

3.04 LAY PIPE TRUE TO LINE AND GRADE FROM LOW POINT PROGRESSING UPHILL. DO NOT LAY PIPE WHEN TRENCH CONDITIONS OR WEATHER ARE UNSUITABLE FOR SUCH WORK. KEEP PIPE INTERIOR CLEAN AND FREE FROM DIRT OR WASTE MATERIALS. INSPECT ALL PIPE FOR DAMAGE, CHECK BELL AND SPIGOT FINISH, ROUNDNESS, AND VOIDS WHICH MAY RESULT IN POOR JOINT PERFORMANCE, ALL DAMAGED,

STRUCTURALLY DEFICIENT PIPE, OR PIPE WITH POOR JOINT CONDITIONS SHALL BE REJECTED AND REMOVED FROM SITE.

3.05 LAY PIPE UPGRADE WITH BELL OR GROOVE ENDS UPSTREAM. USE MANHOLES FOR ALL CHANGES IN GRADE AND DIRECTION. ALL PIPE SHALL BE CAREFULLY PLACED IN TRENCH, DUMPING AND DROPPING OF PIPE AND STRUCTURES INTO THE EXCAVATION WILL NOT BE PERMITTED. PIPE WITH VARYING WALL CLASS MUST NOT BE MIXED BETWEEN MANHOLES OR BOXES. LEAVE AT LEAST 4 JOINTS EXPOSED FOR INSPECTION PURPOSES DURING THE WORKING DAY, AND PROVIDE SUITABLE SAFE ACCESS FOR INSPECTION DURING CONSTRUCTION. ANY DEFECTS DUE TO SETTLEMENT SHALL BE MADE GOOD BY THE CONTRACTOR AT HIS OWN EXPENSE. PROVIDE A TEMPORARY PLUG TO KEEP OUT DIRT, WATER, AND FOREIGN MATERIALS DURING ALL TIMES WHEN LAYING IS NOT IN ACTUAL PROGRESS.

3.06 CONSTRUCT MANHOLE CHANNEL WITH SMOOTH SEMICIRCULAR BOTTOMS MATCHING INSIDE DIAMETERS OF THE CONNECTING SEWERS USING CLASS A3 CONCRETE. CHANGE DIRECTIONS OF FLOW WITH A SMOOTH CURVE OF AS LARGE A RADIUS AS THE MANHOLE SIZE WILL PERMIT. CHANGE SIZE AND GRADE OF CHANNELS GRADUALLY AND EVENLY. CHANNELS MAY BE FORMED DIRECTLY IN THE CONCRETE MANHOLE BOTTOM, MADE OF CHANNEL PIPE, LAID IN CONCRETE OR CONSTRUCTED BY LAYING FULL SECTION SEWER PIPE THROUGH THE MANHOLE AND BREAKING OUT THE TOP HALF WHEN THE SURROUNDING CONCRETE HAS HARDENED. MANHOLE FLOORS OUTSIDE THE CHANNELS SHALL BE SMOOTH AND SHALL HAVE SLOPE BETWEEN 1 AND 2 INCHES PER FOOT TOWARD THE CHANNELS. ALL MANHOLES SHALL BE VERTICALLY PLUMB, GRADE RINGS USED FOR INCREMENTAL ADJUSTMENT OF TOP ELEVATIONS SHALL NOT EXCEED 12-INCHES IN HEIGHT.

3.07 CONSTRUCT INLETS, ENDWALLS, AND OTHER STORM DRAINAGE ITEMS AS DETAILED IN THE LATEST EDITION OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION "ROAD AND BRIDGE SPECIFICATIONS" OR ON DRAWINGS, AS APPLICABLE.

3.08 PRIOR TO ASSEMBLY SEAL ALL JOINTS IN CONCRETE PIPE, MANHOLE RISERS, AND INLET STRUCTURES USING AMPLE BITUMASTIC JOINT SEALANT MEETING ASTM C990 AND OR GROUT AS DIRECTED BY THE ENGINEER TO THOROUGHLY SEAL JOINT, HOME ALL JOINTS TO MAXIMUM DEPTH OF BELL, ENSURING A LEAK-TIGHT SEAL. ALL JOINTS ARE TO BE THOROUGHLY SEALED SUFFICIENT TO PROHIBIT MIGRATION OF SOIL AND WATER THROUGH JOINTS. THE CONTRACTOR MAY USE BRICK AND MASONRY BLOCK OR CONCRETE PIPE CUTOFFS IN CONJUNCTION WITH MORTAR TO FILL THE VOID BETWEEN PIPE CULVERTS AND PRECAST STRUCTURES. SUCH MATERIALS SHALL BE THOROUGHLY WETTED AND BONDED WITH MORTAR. THE REMAINING EXTERIOR AND INTERIOR VOID SHALL BE FILLED AND FINISHED WITH NON-SHRINK HYDRAULIC CEMENT MORTAR TO THE CONTOUR AND FINISH OF THE PRECAST STRUCTURE. PLUG ALL WEEP HOLES, AND LIFTING RINGS UNLESS SPECIFICALLY DIRECTED OTHERWISE BY THE ENGINEER.

3.09 AS EACH JOINT IS LAID, VISUALLY INSPECT TO BE CERTAIN THAT NO JOINTING COMPOUND, GASKET, TRASH, OR STONE IS PROTRUDING FROM THE JOINT OR LYING INSIDE THE PIPE SO AS TO INTERFERE WITH SEALING THE JOINT. PROTECT STORED PIPE FROM ENTRY OF WATER AND DIRT ENTERING THE PIPE. ALL LINES LAID ON 20-DEGREE SLOPES OR MORE SHALL HAVE CONCRETE ANCHORS PLACED AROUND THE PIPE DIRECTLY BELOW THE BELL END OF THE LINE. THE ANCHORS SHALL BE SPACED EVERY OTHER JOINT UNLESS DIRECTED OTHERWISE BY THE ENGINEER; ANCHORS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DETAILS.

3.10 COAT MANHOLE CASTINGS WITH A PROTECTIVE COATING OF COAL TAR PITCH VARNISH IF SHOP COATING HAS BEEN DAMAGED. WHEN APPLICABLE, DURING THE INSTALLATION OF MANHOLES, IF FRAME AND COVER IS NEAR OR WITHIN WHEEL PATH IN ROADWAY, ROTATE CONE TO PLACE THE FRAME OUT OF NORMAL WHEEL PATH.

3.11 ALL DROP INLET TOPS SHALL BE SET ON FLAT TOP MANHOLE ASSEMBLIES TO ENSURE WATERTIGHT SEAL AND PROVISION OF ADEQUATE BEARING SURFACE TO SECURELY ATTACH DROP INLET TOP TO RISER SECTION. PROVISION OF FLAT TOP MANHOLE ASSEMBLIES SHALL BE INCLUDED IN PRICE FOR DROP INLETS AND WILL NOT BE PAID FOR SEPARATELY.

3.12 ALL MANHOLE FRAMES SHALL BE SECURED TO ADJUSTING RING OR RISER SECTION/FLAT TOP ASSEMBLIES WITH BUTYL MASTIC, ANCHOR BOLTS OR OTHER MEANS TO PROVIDE AN IMPACT RESISTANT WATERPROOF SEAL.

3.13 ALL LINES AND MANHOLES SHALL BE VISUALLY INSPECTED BY USE OF MIRRORS OR TELEVISION CAMERAS. ALL STRUCTURES AND PIPES SHALL EXHIBIT ZERO INFILTRATION BASED ON VISIBLE INSPECTION. STORM LINES SHALL EXHIBIT A FULLY CIRCULAR PATTERN WHEN VIEWED FROM ONE MANHOLE TO THE NEXT. LINES, WHICH DO NOT EXHIBIT A TRUE AND CORRECT LINE AND GRADE, ARE OBSTRUCTED OR HAVE STRUCTURAL DEFECTS, SHALL BE CORRECTED TO MEET THESE SPECIFICATIONS AND THE BARREL LEFT CLEAN FOR ITS ENTIRE LENGTH. ACCEPTANCE TESTING MAY INCLUDE CCTV INSPECTION AT THE DIRECTION OF THE ENGINEER. CITY CREWS WILL CONDUCT CCTV SURVEYS AS REQUIRED FOR FINAL INSPECTION.

3.14 WHENEVER FIELD CUTTING OF CONCRETE IS REQUIRED, THE WORK SHALL BE DONE IN A SATISFACTORY MANNER WITH AN APPROVED CUTTING TOOL OR TOOLS WHICH WILL LEAVE A SMOOTH END AT RIGHT ANGLES TO THE AXIS OF THE STRUCTURE AND NOT OTHERWISE DAMAGE THE PIPE OR STRUCTURE. THE METHOD OF CUTTING PIPE SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. SUCH CUTS SHALL BE MADE BY THE CONTRACTOR WITHOUT EXTRA COMPENSATION

3.15 WHEN AN EXISTING MANHOLE OR DROP INLET IS DESIGNATED TO BE ABANDONED AND THE STORM LINES, EITHER ENTERING OR EXITING THE MANHOLE HAVE BEEN FILLED WITH FLOWABLE FILL, THE UPPER PORTION OF THE MANHOLE SHALL BE REMOVED TO A MINIMUM OF TWO FEET BELOW THE PROPOSED FINISHED GRADE, A HOLE PUNCHED IN THE BOTTOM OF THE STRUCTURE, AND THE STRUCTURE BACKFILLED WITH VDOT #57 STONE COMPACTED IN 6-INCH LIFTS. THE REMAINING PORTION SHALL BE BACKFILLED WITH STONE OR ASPHALT TO MATCH ROADWAY CROSS-SECTION. IN OFF ROAD AREAS, AASHTO TYPE III GEOTEXTILE WILL BE LAID ON THE STONE BASE AND SUITABLE SOIL MATERIAL COMPACTED ON TOP TO MATCH SURROUNDING GRADE.

3.16 DRAINAGE DITCHES, GRASS SWALES AND CHANNEL IMPROVEMENTS SHALL BE GRADE AND SHAPED ACCORDING TO ELEVATIONS, SLOPES, WIDTHS, CROSS-SECTIONS AND LENGTHS INDICATED ON PLANS, TAKING CARE TO TIE INTO NATURAL GRADES OF ALL EXISTING OR NATURAL CHANNELS. EXPOSED EARTH AND FILL MATERIALS IN DRAINAGE CHANNELS SHALL BE COMPACTED, SEEDED AND ARMORED AS DIRECTED TO PROTECT NEWLY GRADED AREAS FROM EROSION.

3.17 WHEN AN EXISTING STORM LINE IS DESIGNATED TO BE ABANDONED IN PLACE, THE LOW END OF THE LINE IS TO BE PLUGGED AND FLOWABLE FILL PUMPED INTO THE LINE UNTIL LINE IS COMPLETELY FILLED.

END OF SECTION

SECTION 02730 - SANITARY SEWER SYSTEM

1. GENERAL

1.01 DESCRIPTION: THIS SECTION SPECIFIES ALL SANITARY SEWER WORK ON THIS PROJECT.

1.02 REFERENCE SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN NATIONAL STANDARDS INSTITUTE.....ANSI

B. AMERICAN SOCIETY FOR TESTING AND MATERIALS.....ASTM

C. AMERICAN WATER WORKS ASSOCIATION.....AWWA

D. AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION.....AREMA.

E. NATIONAL BUREAU OF STANDARDS.....NBS

1.03 PROJECT CONDITIONS

A. SANITARY SEWER SYSTEM IMPROVEMENTS AND CONSTRUCTION OPERATIONS SHALL FOLLOW VIRGINIA DEPARTMENT OF HEALTH AND VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY STANDARDS, INCLUDING REQUIREMENTS FOR SEPARATION OF WATER MAINS AND SANITARY AND COMBINED SEWER LINES. ALL TIE IN CONNECTIONS SHALL BE COORDINATED WITH THE UTILITIES DIVISION.

B. PARALLEL INSTALLATION

(1) NORMAL CONDITIONS - SEWER LINES AND MANHOLES SHALL BE CONSTRUCTED AT LEAST 10 FEET HORIZONTALLY FROM A WATER LINE WHENEVER POSSIBLE. THE DISTANCE SHALL BE MEASURED EDGE-TO-EDGE.

(2) UNUSUAL CONDITIONS - WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF AT LEAST 10 FEET, THEN MAXIMUM HORIZONTAL SEPARATION SHALL BE PROVIDED WITH VERTICAL SEPARATION OF BOTTOM OF WATER LINE AT LEAST 18 INCHES ABOVE TOP OF SEWER. WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF AWWA APPROVED DUCTILE IRON WATER PIPE PRESSURE-TESTED IN PLACE TO 50 PSI WITHOUT LEAKAGE PRIOR TO BACKFILLING. SEWER MANHOLES WITHIN TEN FEET OF A WATERLINE SHALL BE OF WATERTIGHT CONSTRUCTION, INCLUDING THE FRAME AND COVER AND LEAK TESTED IN PLACE.

C. CROSSING 1

(1) NORMAL CONDITIONS - SEWERS CROSSING UNDER WATER LINES SHALL BE LAID TO PROVIDE A SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE SEWER WHENEVER POSSIBLE.

(2) UNUSUAL CONDITIONS - WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION DESCRIBED IN "CROSSING, NORMAL CONDITIONS," PARAGRAPH ABOVE, THE FOLLOWING CONSTRUCTION SHALL BE USED.

a. SEWERS PASSING OVER OR UNDER WATER LINES SHALL BE CONSTRUCTED OF CAST OR DUCTILE IRON PIPE WITH MECHANICAL JOINTS AS DESCRIBED IN "PARALLEL INSTALLATION, UNUSUAL CONDITIONS" ABOVE.

b. SEWERS PASSING OVER WATER LINES SHALL BE LAID TO PROVIDE:

(1) VERTICAL SEPARATION OF AT LEAST 18 INCHES BETWEEN BOTTOM OF SEWER AND TOP OF WATER LINE,
(2) ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS TO PREVENT EXCESSIVE DEFLECTION OF THE JOINTS AND SETTLING ON AND BREAKING WATER LINE,
(3) MAXIMUM SEPARATION OF WATER AND SEWER LINE JOINTS.
(4) SANITARY AND/OR COMBINED SEWERS OR SEWER MANHOLES - NO WATER MAINS/PIPES SHALL PASS THROUGH OR COME IN CONTACT WITH ANY PART OF A SEWER OR SEWER MANHOLE. WATER MAINS SHALL BE PLACED AT LEAST 10 FEET AWAY FROM ANY PART OF A MANHOLE.
(5) NO SEWER SHALL PASS WITHIN 50 FEET OF A DRINKING WATER SUPPLY WELL, SOURCE OR STRUCTURE UNLESS SPECIAL CONSTRUCTION AND PIPE MATERIALS ARE USED TO OBTAIN ADEQUATE PROTECTION.

1.04 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN SECTION 01000 - GENERAL REQUIREMENTS.

A. SHOP DRAWINGS OF THE FOLLOWING:

(1) PIPE AND PIPING SPECIALS

(2) PRECAST CONCRETE MANHOLE CASTING SECTIONS

(3) WATERPROOF AND STANDARD MANHOLE FRAMES AND COVERS

(4) DETAILS FOR ALL PIPE AND MANHOLE CONNECTIONS

(5) MILL FABRICATED STEEL SEWER PIPE, INCLUDING COMPLIANCE AFFIDAVIT

(6) SHOP DRAWINGS AND LAY SCHEDULE FOR ALL TUNNELING, INCLUDING LINER PLATES AND RIBS.

(7) 50-YEAR DESIGN LIFE MANUFACTURER'S WARRANTY FOR ALL SEWER PIPE

(8) A LAY SCHEDULE FOR ALL PIPE OVER 24-INCHES

B. SUBMITTAL: REINFORCED CONCRETE PIPE DETAILS

C. SUBMITTAL: DUCTILE IRON PIPE DETAILS

D. SUBMITTAL: PIPE FITTINGS DETAILS

E. SUBMITTAL: MECHANICAL JOINTS AND JOINTING MATERIALS DETAILS

F. SUBMITTAL: PUSH-ON JOINT AND RUBBER GASKET DETAILS

G. SUBMITTAL: CEMENT MORTAR LINING DETAILS

H. SUBMITTAL: EXTERIOR, BITUMINOUS COATING DETAILS

I. SUBMITTAL: POLYVINYL CHLORIDE PLASTIC GRAVITY SEWER PIPE DETAILS

J. SUBMITTAL: FLEXIBLE COUPLING DETAILS

K. SUBMITTAL: PRECAST MANHOLE DETAILS

2. PRODUCTS

2.01 REINFORCED CONCRETE PIPE BELOW 42-INCHES IN DIAMETER SHALL BE A MINIMUM OF CLASS III, B-WALL, GASKETED JOINT PIPE MEETING REQUIREMENTS OF ASTM C 76 FOR THE CLASS UNLESS SHOWN OTHERWISE ON THE DRAWINGS. PIPE ABOVE 42-INCHES IN DIAMETER SHALL BE A MINIMUM OF CLASS III, C-WALL PIPE END SHALL HAVE O-RING GASKET GROOVE PROVIDED DURING MANUFACTURING PROCESS.

A. PROTECTIVE COATING FOR CONCRETE PIPE INTERIOR SHALL BE TWO COATS OF COAL TAR SOLUTION SUCH AS INTERNATIONAL PROTECTIVE COATINGS, "INTERTUF 100," PITTSBURG PAINT, "COAL CAT" 97-640/97-641, OR MADE WITH CALCAREOUS AGGREGATE WITH AZ FACTOR OF 90.

B. RUBBER GASKETS AND JOINTS OF CONCRETE PIPE SHALL MEET REQUIREMENTS OF ASTM C 443. GASKETS SHALL BE THE O-RING TYPE.

C. PIPE AND JOINTS SHALL BE TESTED IN ACCORDANCE WITH APPLICABLE SECTIONS OF ASTM C 76, ASTM C 443, ASTM C 14, AND ASTM C 497.

(1) PROVIDE THREE-EDGE BEARING METHOD FOR EXTERNAL LOAD CRUSHING STRENGTH, ABSORPTION, PERMEABILITY, AND CORE STRENGTH TESTS ON EVERY FIFTIETH SECTION OF EACH SIZE OF PIPE.

(2) EACH SECTION OF EACH PIPE SHALL BE HYDROSTATICALLY TESTED OR VACUUM TESTED.

D. CEMENT USED IN THE MANUFACTURING OF CONCRETE PIPE SHALL BE ASTM C 150 TYPE II.

2.02 DUCTILE IRON PIPE SHALL MEET REQUIREMENTS OF ANSI/AWWA C151 FOR THE MINIMUM PRESSURE CLASS OF 150, (THICKNESS CLASS 50 MINIMUM). THICKNESS CLASSES SHALL MEET REQUIREMENTS OF ANSI/AWWA C150 ACCORDING TO DEPTH OF BURIAL. MINIMUM LAY LENGTH SHALL BE 18 FEET EXCEPT WHERE FIELD CUT TO TIE INTO STRUCTURES.

2.03 GRAY IRON OR DUCTILE IRON FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C110 FOR COMPACT FITTINGS, WITH MINIMUM WORKING PRESSURE RATING OF 250 PSI, (MINIMUM THICKNESS CLASS 54). FITTINGS SHALL BE HYDROSTATICALLY TESTED BY THE MANUFACTURER AND RESULTS PROVIDED AS DIRECTED BY THE ENGINEER.

2.04 MECHANICAL JOINTS AND JOINTING MATERIALS SHALL MEET REQUIREMENTS OF ANSI/AWWA C111. ONLY HIGH STRENGTH LOW ALLOY STEEL COR-TEN BOLTS SHALL BE USED.

A. MECHANICAL JOINT RETAINER GLANDS SHALL BE "MEGALUG" MANUFACTURED BY EBAA IRON, INCORPORATED, SERIES 1400 "BLOCK BUSTER" WEDGE ACTION RETAINER GLAND MANUFACTURED BY UNI-FLANGE, OR "ROMA-GRIP" AS MANUFACTURED BY ROMAC INDUSTRIES.

B. METAL HARNESS SHALL BE GALVANIZED RODS AND CLAMPS AS DETAILED ON DRAWINGS.

C. THE MECHANICAL JOINT SHALL CONSIST OF: A BELL CAST INTEGRALLY WITH THE PIPE OR FITTING AND PROVIDED WITH AN EXTERIOR FLANGE HAVING CORED OR DRILLED BOLT HOLES AND INTERIOR ANNULAR RECESSES FOR THE SEALING GASKET AND THE SPIGOT OF THE PIPE OR FITTING; A PIPE OR FITTING SPIGOT; A SEALING GASKET AND A SEPARATE DUCTILE IRON FOLLOWER GLAND HAVING CORED OR DRILLED BOLT HOLES WITH DUCTILE IRON TEE HEAD BOLTS AND HEXAGON NUTS. THE JOINT SHALL BE DESIGNED TO PERMIT NORMAL EXPANSION, CONTRACTION, AND DEFLECTION OF THE PIPE OR FITTING WHILE MAINTAINING A LEAK PROOF JOINT CONNECTION. THE MECHANICAL JOINT SHALL CONFORM TO THE REQUIREMENTS OF FEDERAL SPECIFICATION WW-P-421, AWWA C111 AND ASTM A536 SPECIFICATION FOR DUCTILE IRON CASTINGS.

2.05 PUSH-ON JOINT DUCTILE IRON PIPE SHALL CONFORM TO AWWA C151/ANSI A21.51 (SUCH AS "FASTITE," "TYTON," OR "BELL-TITE."). THE GASKET SHALL BE OF SUCH SIZE AND SHAPE TO PROVIDE AN ADEQUATE COMPRESSIVE FORCE AGAINST THE PLAIN END AND SOCKET AFTER ASSEMBLY TO AFFECT A POSITIVE SEAL. GASKETS SHALL BE VULCANIZED NATURAL OR VULCANIZED SYNTHETIC RUBBER, AND COMPLY WITH AWWA C111/ANSI A21.11.

2.06 DUCTILE IRON PIPES 24-INCH DIAMETER AND SMALLER SHALL BE FACTORY LINED WITH HIGH ALUMINA CEMENT MORTAR, DUCTILE IRON PIPE ABOVE 24-INCHES SHALL BE LINED WITH REGULAR CEMENT MORTAR MEETING THE THICKNESSES SPECIFIED BELOW. DUCTILE IRON PIPE WITH FACTORY APPLIED 40 MIL THICK CERAMIC EPOXY LINING, PROTECTO 401 OR EQUIVALENT IS ALSO ACCEPTABLE. CEMENT MORTAR SHALL MEET REQUIREMENTS OF ANSI/AWWA C104. LINING THICKNESS SHALL BE A MINIMUM OF 0.125 INCH FOR 4 TO 12-INCH DIAMETER PIPES, AND 0.187 INCH THICK FOR 14 TO 24-INCH PIPES.

A. A FACTORY STANDARD BITUMINOUS SEAL COAT SHALL BE APPLIED OVER THE HIGH ALUMINA CEMENT LINING. THE ENTIRE INSIDE OF THE SOCKET, INCLUDING THE GASKET CAVITY, SHALL BE COATED WITH A MINIMUM OF 8 MILS OF EPOXY TO PREVENT CORROSION IN THE JOINT. SEAL COAT FOR REGULAR CEMENT MORTAR LINED PIPE SHALL MEET THE REQUIREMENTS OF ANSI/AWWA C104. ALL BELLS AND JOINTS SHALL HAVE FACTORY APPLIED JOINT COMPOUND MEETING THE ANTI-CORROSION PROPERTIES OF THE PIPE LINING MATERIAL.

B. THE CONTRACTOR SHALL PERFORM ANY FIELD REPAIRS REQUIRED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS TO PRESERVE THE INTEGRITY OF FACTORY APPLIED LININGS.

2.07 EXTERIOR, BITUMINOUS COATING FOR GRAY IRON FITTINGS AND DUCTILE IRON PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C151.

2.08 POLYVINYL CHLORIDE (PVC) PLASTIC GRAVITY SEWER PIPE SHALL MEET REQUIREMENTS OF ASTM D 3034 AND BE INTEGRAL BELL, GASKETED JOINT PIPE WITH DIMENSION RATIO (DR) OF 26 AND MINIMUM PIPE STIFFNESS (PS) OF 115 PSI, MEET ASTM D 2241 WITH DR OF 26, OR MEET ASTM D 1785, SCHEDULE 40. LARGER DIAMETER SDR 26 PVC PIPE FROM 18 TO 27 INCH DIAMETER SHALL COMPLY WITH REQUIREMENTS OF ASTM F679. MINIMUM LAY LENGTHS SHALL BE 12.5 FEET FOR PIPES 15-INCHES IN DIAMETER AND LESS, AND 11 FEET FOR PIPES ABOVE 15-INCHES IN DIAMETER.

A. PIPE JOINT SHALL MEET REQUIREMENTS OF ASTM D 3212 OR D 3139 AS APPLICABLE.

B. RUBBER GASKETS SHALL MEET PHYSICAL REQUIREMENTS SPECIFIED IN ASTM F 477 IN ALL RESPECTS.

C. POLYVINYL CHLORIDE (PVC) SEWER LATERAL PIPE: FITTINGS AND SPECIALS SHALL BE SCHEDULE 40 MEETING REQUIREMENTS OF ASTM D 1785 WITH INTEGRAL RUBBER RING WALL BELL AND SPIGOT, SOLVENT WELD, OR MECHANICAL JOINTS SUITABLE FOR THE CONVEYANCE OF RAW DOMESTIC SEWAGE. PIPE SHALL BE FURNISHED IN STANDARD NOMINAL LENGTHS.

2.09 FLEXIBLE COUPLINGS SHALL BE MANUFACTURED BY FERNCO OR APPROVED EQUAL. THE CONNECTOR SHALL BE OF A SIZE SPECIFICALLY DESIGNED FOR THE PIPE MATERIAL AND SIZE BEING INSTALLED.

2.10 MANHOLES SHALL BE PRECAST REINFORCED CONCRETE MANHOLE SECTIONS MEETING REQUIREMENTS OF ASTM C 478 AND BE IN ACCORDANCE WITH STANDARD DETAILS. SECTION ENDS SHALL HAVE O-RING GASKET GROOVE PROVIDED DURING MANUFACTURING PROCESS.

A. JOINTS FOR PRECAST CONCRETE MANHOLE RISER SECTIONS SHALL BE SEALED WITH FLEXIBLE BUTYL RESIN SEALANT AS MANUFACTURED BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. SEALANT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

B. PROTECTIVE COATING FOR CONCRETE MANHOLE SECTION INTERIOR SHALL BE TWO COATS OF COAL TAR EPOXY EQUAL TO PORTER PAINTS "PORTERTUF 2000" OR MANUFACTURED WITH CALCAREOUS AGGREGATE SO THAT THE FINISHED PRODUCT WILL HAVE AN AZ FACTOR EQUAL TO 90.

C. PIPE TO MANHOLE CONNECTION SHALL BE SEALED WITH A FLEXIBLE BOOT, GASKET, OR SEAL AND MEET REQUIREMENTS OF ASTM C 923.

(1) WHEN THE BOOT IS USED, THE PORT SHALL BE CORED TO THE SIZE, SHAPE, SURFACE FINISH, AND LOCATION REQUIRED AND NOT CAST IN THE MANHOLE. ANGULAR ADJUSTMENTS THROUGH 20 DEGREES SHALL BE ALLOWED. THE FLEXIBLE BOOT SHALL BE A 3/8-INCH THICK NEOPRENE COMPOUND MEETING ASTM C 443 SPECIFICATIONS. THE BOOT SHALL BE SECURED TO THE PORT WITH AN INTERNAL ALUMINUM EXPANDING BAND AND TO THE PIPE WITH A NONMAGNETIC CORROSION RESISTANT STEEL EXTERNAL BAND. BOOT SEAL SHALL BE "KOR-N-SEAL" AS MANUFACTURED BY NATIONAL POLLUTION CONTROL SYSTEMS, INC.

(2) WHEN GASKET IS USED, THE GASKET SHALL BE A RUBBER PRESSED WEDGE GASKET CAST INTO THE MANHOLE WITH A MAXIMUM DEFLECTION OF 15 DEGREES AS MANUFACTURED BY PRESS-SEAL GASKET CORPORATION.

(3) THE CONNECTOR SHALL BE OF A SIZE SPECIFICALLY DESIGNED FOR THE PIPE MATERIAL AND SIZE BEING INSTALLED.

D. MANHOLE FRAMES AND COVERS SHALL BE MANUFACTURED FROM CLASS 30 GRAY IRON, MEETING THE REQUIREMENTS OF ASTM A48, MANUFACTURED TO THE DIMENSIONS AND CONFIGURATIONS SHOWN ON STANDARD DETAILS AND SHALL HAVE 4 OR 6 1-INCH DIAMETER HOLES IN THE FLANGE OF THE FRAME, AS APPLICABLE. MINIMUM INSIDE DIAMETER OF THE OPENING SHALL BE 24 INCHES. MANHOLES CASTINGS MAY BE EITHER BITUMINOUS COATED OR PLAIN. THE BEARING SURFACE OF THE FRAMES AND COVERS SHALL BE MACHINED AND THE COVER SHALL SEAT FIRMLY INTO THE FRAME WITHOUT ROCKING. COVERS ARE TO BE EMBOSSED ALONG THE PERIMETER WITH THE WORDS "SANITARY SEWER." APPROVED CASTINGS ARE THE US FOUNDRY 710 RING AND DP COVER, EAST JORDAN IRON WORKS 2027 FRAME AND COVER, OR APPROVED EQUAL. ALL CASTINGS ARE TO BE MADE IN THE U.S.A. A VULCAN V-1883 IS TO BE USED WITH FLAT TOP MANHOLES UNLESS THE TOP OF THE MANHOLE IS LESS THAN 1-FOOT ABOVE THE 100-YEAR BASE FLOOD ELEVATION. IN THAT CASE, A WATERPROOF FRAME AND COVER SHALL BE USED.

E. LAMPSTACK FRAMES AND COVERS SHALL BE MANUFACTURED FROM CLASS 30 GRAY IRON, MEETING THE REQUIREMENTS OF ASTM A48, STANDARD SPECIFICATION FOR GRAY IRON CASTINGS. LAMPSTACK FRAMES AND COVERS MAY BE EITHER BITUMINOUS COATED OR PLAIN. LAMPSTACK FRAME AND COVER SHALL CONFORM TO THE DIMENSIONS AND CONFIGURATION OF STANDARD DETAILS.

F. WATERPROOF BOLT-DOWN FRAMES AND COVERS SHALL HAVE 4 STAINLESS STEEL BOLTS AT 90 DEGREES AND ONE POLYVINYL GASKET BETWEEN COVER AND FRAME SEAT. DIMENSIONS AND CONFIGURATIONS SHOWN ON STANDARD DETAILS AND FRAME IS TO HAVE A MINIMUM OF FOUR 1-INCH DIAMETER HOLES IN FLANGE OF THE FRAME. WATERPROOF FRAMES AND COVERS ARE TO BE UTILIZED WHENEVER MANHOLE TOP IS SET LOWER THAN 1-FOOT ABOVE THE 100-YEAR BASE FLOOD ELEVATION. COVERS ARE TO BE EMBOSSED ALONG THE PERIMETER WITH THE WORDS "SANITARY SEWER." APPROVED MODELS ARE TO BE US FOUNDRY 710 RING AND DP-SSG COVER, EAST JORDAN IRON WORKS 2027 FRAME AND COVER WITH WIPER GASKET OR APPROVED EQUAL. ALL CASTINGS ARE TO BE MADE IN THE U.S.A.

G. FRAME TO MANHOLE BOLTS SHALL BE STAINLESS STEEL EXPANSION BOLTS MANUFACTURED BY HILTI, RAWL OR LIEBIG. THE FRAME SHALL ALSO BE SEALED AND ANCHORED TO THE TOP OF THE MANHOLE RISER SECTIONS WITH FLEXIBLE BUTYL RESIN SEALANT IN 1-INCH ROPE FORM.

2.11 DETECTABLE TAPE SHALL HAVE A METALLIC CORE PROTECTED BY A PLASTIC JACKET. THE TAPE SHALL BE CONTINUOUSLY MARKED INDICATING THAT A SEWER LINE IS BURIED BENEATH THE TAPE.

2.12 FLEXIBLE, WATERTIGHT CONNECTORS FOR CONNECTING SERVICE LATERALS TO NEW CONCRETE PIPE SHALL BE "KOR-N-TEE" CONNECTOR MANUFACTURED BY NPC, INC., OF MILFORD, NEW HAMPSHIRE, OR APPROVED EQUAL.

2.13 CLEANOUT ASSEMBLY AND VERTICAL PIPE FOR CLEANOUTS SHALL BE AS INDICATED IN STANDARD DETAIL FOR SEWER CONNECTIONS. SERVICE SADDLES SHALL CONFORM TO ASTM D3034.

2.14 STEEL PIPE FOR GRAVITY SEWER MAINS, AERIAL CROSSINGS, AND VENT PIPES SHALL MEET THE REQUIREMENTS OF AWWA C200, AWWA STANDARD FOR MILL TYPE STEEL WATER PIPE. NOMINAL PIPE DIAMETER AND WALL THICKNESS SHALL BE AS INDICATED ON THE DRAWINGS. PIPE SHALL BE HIGH STRENGTH STEEL, SPIRAL WELDED OR SMOOTH-WALL SEAMLESS MANUFACTURED IN ACCORDANCE WITH ASTM A139, STANDARD SPECIFICATION FOR ELECTRIC-FUSION (ARC)-WELDED STEEL PIPE (NPS 4 AND OVER) AND ASTM A283, STANDARD SPECIFICATION FOR LOW AND INTERMEDIATE TENSILE STRENGTH CARBON STEEL PLATES, GRADE "B" STEEL WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI.

A. STEEL PIPE FOR GRAVITY SEWER MAINS SHALL BE SEAMLESS AND EITHER FURNACE-WELDED OR ELECTRICALLY WELDED PIPE, GRADE B. THE INTERIOR AND EXTERIOR COATING SHALL BE COAL-TAR ENAMEL IN ACCORDANCE WITH AWWA C203.

B. STEEL PIPE FOR AERIAL CREEK CROSSINGS (WITHOUT ENCASEMENT AND CARRIER PIPE): THE OUTSIDE OF THE PIPE SHALL HAVE ONE COAT OF ZINC CHROMATE PRIMER CONFORMING TO FEDERAL SPECIFICATION TT-86-A AND AFTERWARDS PAINTED WITH COAL TAR ENAMEL. THE INTERIOR LINING SHALL BE A COAL-TAR ENAMEL COATING AS SPECIFIED UNDER AWWA C203.

C. STEEL ENCASEMENT PIPE FOR BORING APPLICATIONS: ENCASEMENT PIPE SHALL MEET APPLICABLE VDOT AND AREA SPECIFICATIONS. CASING PIPE SHALL INCLUDE PIPE CARRIERS (SPIDERS) TO SUPPORT CARRIER PIPE.

D. THE SPIDERS NECESSARY TO SUPPORT THE CARRIER PIPE INSIDE OF THE STEEL ENCASEMENT PIPE SHALL CONFORM TO BOTH THE SHAPE AND DIMENSIONS OF STANDARD DETAIL, INCLUDING REQUIREMENTS FOR SPIDER SPACING. SPIDERS SHALL BE OF HEAVY-DUTY GALVANIZED STEEL.

E. STEEL VENT PIPES FOR MANHOLES: THE VENT PIPE SHALL BE MADE FROM 4-INCH SCHEDULE 40. THE PIPE SHALL BE COATED INSIDE AND OUT IN ACCORDANCE WITH AWWA C203 AND CONSTRUCTED IN ACCORDANCE WITH STANDARD DETAILS.

2.15 LINER PLATES SHALL BE ONE-PIECE STEEL MEETING THE REQUIREMENTS OF ASTM A 569, ASTM A 570, OR ASTM A 611. PLATES SHALL HAVE AN ULTIMATE TENSILE STRENGTH OF AT LEAST 42,000 PSI AND YIELD STRENGTH OF 28,000 PSI. GAGE THICKNESS SHALL BE A MINIMUM OF 8 GAGE. THE LINER PLATE AND BOLTS SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153. THE LINER PLATES SHALL BE ASPHALT COATED TO MEET AREA 1-14-13. FOR TWO FLANGE PLATES, THE MINIMUM THICKNESS SHALL BE 0.135 INCHES. PLATES SHALL BE MANUFACTURED BY ARMCO STEEL CORPORATION, COMMERCIAL SHEARING, INCORPORATED, REPUBLIC STEEL CORPORATION, OR APPROVED EQUAL. GROUT HOLES 1½ INCHES OR 2 INCHES (OR LARGER) IN DIAMETER SHALL BE PROVIDED IN EACH RING TO PERMIT GROUTING AS THE ERECTION OF THE TUNNEL LINER PLATES PROGRESSES. GROUT HOLE SCREW PLUGS SHALL BE PROVIDED IN PLATES. STEEL BOLTS SHALL MEET REQUIREMENTS OF ASTM A449 FOR PLATE THICKNESS EQUAL TO OR GREATER THAN 0.209 INCH AND ASTM A 307 FOR PLATE THICKNESS LESS THAN 0.209 INCH. THE NUT SHALL MEET REQUIREMENTS OF ASTM A 307, GRADE A.

A. GROUT MIX FOR FILLING VOIDS IN BETWEEN CARRIER PIPE AND TUNNEL SHALL CONSIST OF THE FOLLOWING MATERIALS PROPERLY MIXED IN PROPORTIONS BY WEIGHT.

1) 1.0 PART CEMENT,

2) 3.0 PARTS FINE SAND, 100 PERCENT SHALL PASS NO. 16 SIEVE, AND

3) 0.5 TO 0.6 PART WATER.

B. CARRIER PIPE FOR CASINGS AND TUNNELS SHALL BE MECHANICAL JOINT OR RESTRAINED JOINT DUCTILE IRON PIPE, MINIMUM THICKNESS CLASS 50 UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS.

3. EXECUTION

3.01 TAKE ALL PRECAUTIONS NECESSARY TO INSURE THAT PIPE, FITTINGS, AND RELATED ITEMS ARE NOT DAMAGED IN UNLOADING, HANDLING, AND PLACING IN TRENCH. EXAMINE EACH PIECE OF MATERIAL JUST PRIOR TO INSTALLATION TO DETERMINE THAT NO DAMAGE HAS OCCURRED. REMOVE ANY DAMAGED MATERIAL FROM THE SITE AND REPLACE WITH UNDAMAGED MATERIAL. ALL SANITARY SEWER PIPE SHALL BE SDR 26/SCHEDULE 40 PVC UNLESS OTHERWISE NOTED ON PLANS OR DIRECTED BY THE ENGINEER.

A. KEEP PIPE CLEAN. EXERCISE CARE TO KEEP FOREIGN MATERIAL AND DIRT FROM ENTERING PIPE DURING STORAGE, HANDLING, AND PLACING IN TRENCH. CLOSE ENDS OF IN-PLACE PIPE AT THE END OF ANY WORK PERIOD TO PREVENT ENTRY OF ANIMALS AND FOREIGN MATERIAL.

B. BED PIPE AS SPECIFIED IN SECTION 02220 - TRENCHING AND BACKFILLING. IN AREAS OF ROCK OUTCROPPINGS OR LARGE ROCK COBBLES, PROVIDE A

MINIMUM OF 6-INCHES OF COARSE AGGREGATE BEDDING BETWEEN PIPE AND ROCK.

C. DO NOT LAY PIPE WHEN WEATHER OR TRENCH CONDITIONS ARE UNSUITABLE.

D. CUT PIPE IN ACCORDANCE WITH MANUFACTURES RECOMMENDATIONS. NO WELDING, FLAME CUTTING OR FLAME TAPPING WILL BE ALLOWED. ALL CUTS IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE MADE BY THE CONTRACTOR WITHOUT EXTRA COMPENSATION.

3.02 LAY GRAVITY SEWERS SO AS TO MAINTAIN A TRUE ALIGNMENT AND GRADE AS INDICATED ON DRAWINGS. AFTER COMPLETION, THE PIPE SHALL EXHIBIT A FULL CIRCLE OF LIGHT WHEN LIGHTED AT ONE MANHOLE AND VIEWED FROM THE NEXT.

A. THE CONTRACTOR SHALL VERIFY DEPTHS AND DIAMETERS OF EXISTING SEWER, AND LOCATIONS OF LATERAL TIES AS CALLED FOR ON PROJECT PLANS PRIOR TO INITIATING PIPE LAYING OPERATIONS TO ENSURE ADEQUATE FALL FOR ALL NEWLY INSTALLED SEWERS. AFTER THE TRENCH FOUNDATION HAS BEEN PROPERLY GRADED TO RECEIVE THE PIPE, THE PIPE SHALL BE CAREFULLY LOWERED INTO THE TRENCH WITH APPROVED METHODS. UNDER NO CIRCUMSTANCES SHALL THE PIPE OR ACCESSORIES BE DROPPED OR DUMPED INTO THE TRENCH. ALL DAMAGED PIPE SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE. COMMENCE LAYING GRAVITY SEWERS AT THE LOWEST POINT ON A SECTION OF LINE AND LAY PIPE WITH THE BELL ENDS UPHILL. THE CONTRACTORS SHALL LEAVE AT LEAST 4 JOINTS EXPOSED FOR INSPECTION PURPOSES DURING THE WORKING DAY AND PROVIDE SUITABLE SAFE ACCESS FOR INSPECTION. ANY DEFECTS NOTED SHALL BE MADE GOOD BY THE CONTRACTOR AT HIS OWN EXPENSE.

B. PIPE JOINT. PREPARATORY TO MAKING PIPE JOINTS ON GRAVITY SEWER LINES, CLEAN AND DRY ALL SURFACES OF JOINT PIPE AND JOINTING MATERIAL. USE LUBRICANTS, PRIMERS, ADHESIVES, AND SIMILAR MATERIALS AS RECOMMENDED BY THE MANUFACTURERS. PLACE, FIT, JOIN, AND ADJUST THE JOINTING MATERIALS OR FACTORY FABRICATED JOINTS AS RECOMMENDED BY THE MANUFACTURER TO OBTAIN THE DEGREE OF WATERTIGHTNESS REQUIRED. AS SOON AS POSSIBLE AFTER THE JOINT IS MADE, PLACE SUFFICIENT BACKFILL MATERIAL, AS SPECIFIED UNDER SECTION 02220 - TRENCHING AND BACKFILLING, ALONG EACH SIDE OF THE PIPE TO RESIST FORCES THAT MIGHT TEND TO MOVE THE PIPE OFF LINE AND GRADE.

C. BACKFILL AS SPECIFIED UNDER SECTION 02220 - TRENCHING AND BACKFILLING. PLACE BACKFILL OVER THE PIPE IMMEDIATELY AFTER THE PIPE HAS BEEN LAID.

D. ENCASE ALL UNDER STREAMBED CROSSINGS IN CLASS A3 CONCRETE PER STANDARD DETAILS. RAVINE, ABOVEGROUND, OVERHEAD, AND OVERWATER CROSSINGS SHALL BE ADEQUATELY SUPPORTED BY PIPE SUPPORT PIERS AS SHOWN ON STANDARD DETAILS. KRAFT PAPER SHALL BE PLACED BETWEEN ALL PIPE, CONCRETE AND STEEL STRAP CONTACT POINTS.

E. WHENEVER PIPE LAYING IS SUSPENDED, THE UPPER END OF THE PIPE SHALL BE PLUGGED TO KEEP OUT DIRT, WATER, ANIMALS AND OTHER FOREIGN MATTER OR SUBSTANCES. THIS PLUG SHALL BE KEPT IN THE END OF THE PIPE LINE AT ALL TIMES WHEN LAYING IS NOT IN ACTUAL PROGRESS.

F. SEWER LATERALS SHALL BE CONNECTED TO THE MAIN BY MEANS OF AN IN-LINE MONOLITHIC WYE OR WITH A TAP AND SADDLE INSTALLED OVER A HOLE CUT IN THE TOP QUADRANT OF EXISTING SEWERS AT AN ANGLE OF FORTY-FIVE

DEGREES, WITH RESPECT TO FLOW DIRECTION. THE HOLE SHALL BE CUT WITH A MECHANICAL CIRCULAR TYPE SAW CUTTER DESIGNED FOR THE PARTICULAR USE AND RENDERING A SMOOTH UNIFORM CUT WITH NO DAMAGE TO THE MAIN AND IS ONE WHICH RETRIEVES THE PLUG. THE COST FOR SUCH CUT-INS SHALL BE INCLUDED IN THE COST OF THE LATERAL. A COMBINATION WYE IS TO BE PROVIDED AT THE CLEANOUT SET AT THE PROPERTY LINE. ALL LATERALS ARE TO BE LEFT EXPOSED UNTIL THEY CAN BE INSPECTED. LATERAL TRENCH SUPPORT, BEDDING, AND BACKFILL SHALL CONFORM TO SPECIFICATIONS FOR SEWER MAINS. ALL WYES, SADDLES, LATERALS, AND CLEANOUT ASSEMBLIES SHALL BE EMBEDDED IN VDOT #57 STONE. WHERE LATERALS ARE BORED, THE ENTIRE SEWER SERVICE FROM MAIN TO PROPERTY LINE SHALL BE DUCTILE IRON PIPE. THE FACE OF THE BORE PIT SHALL BE A MINIMUM DISTANCE OF FIVE FEET FROM THE EDGE OF THE PAVEMENT ON EITHER SIDE. LATERALS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DETAILS.

G. ALL SEWERS LAID ON GRADES OVER 20 PERCENT SHALL BE CONSTRUCTED OF DIP WITH CONCRETE ANCHORS PLACED ON BELL ENDS, OR AT THE SPACING SHOWN ON THE PLANS. ANCHORS SHALL BE CONSTRUCTED ACCORDING TO STANDARD DETAILS.

3.03 JOIN MECHANICAL JOINT PIPE AS FOLLOWS:

A. THOROUGHLY CLEAN INSIDE OF THE BELL AND 8 INCHES OF THE OUTSIDE OF THE SPIGOT END OF THE JOINING PIPE TO REMOVE OIL, GRIT, EXCESS COATING, AND OTHER FOREIGN MATTER FROM THE JOINT. PAINT THE BELL AND THE SPIGOT WITH SOAP SOLUTION (HALF CUP GRANULATED SOAP DISSOLVED IN 1 GALLON WATER). SLIP CAST-IRON GLAND ON SPIGOT END WITH LIP EXTENSION OF GLAND TOWARD END OF PIPE. PAINT RUBBER GASKET WITH OR DIP INTO THE SOAP SOLUTION AND PLACE ON THE SPIGOT END WITH THICK EDGE TOWARD THE GLAND.

B. PUSH THE SPIGOT END FORWARD TO SEAT IN THE BELL. THEN CAREFULLY PRESS THE GASKET INTO THE BELL SO THAT IT IS LOCATED EVENLY AROUND THE JOINT. MOVE THE GLAND INTO POSITION, INSERT BOLTS, AND SCREW NUTS UP FINGER TIGHT. THEN TIGHTEN ALL NUTS TO TORQUE LISTED BELOW IN ACCORDANCE WITH AWWA C600.

BOLTS SIZE - INCHES	TORQUE FEET - POUNDS
5/8	45 - 60
3/4	75 - 90
1	100 - 120
1-1/4	120 - 150

C. TIGHTEN NUTS ON ALTERNATE SIDES OF THE GLAND UNTIL PRESSURE ON THE GLAND IS EQUALLY DISTRIBUTED.

3.04 JOIN PUSH-ON JOINT PIPE AS FOLLOWS:

A. THOROUGHLY CLEAN INSIDE OF THE BELL AND 8 INCHES OF THE OUTSIDE OF THE SPIGOT END OF THE JOINING PIPE TO REMOVE OIL, GRIT, EXCESS COATING, AND OTHER FOREIGN MATTER. FLEX RUBBER GASKET AND INSERT IN THE GASKET RECESS OF THE BELL SOCKET. APPLY A THIN FILM OF GASKET LUBRICANT SUPPLIED BY PIPE MANUFACTURER TO EITHER THE GASKET OR THE SPIGOT END OF THE JOINING PIPE.

B. START SPIGOT END OF PIPE INTO SOCKET WITH CARE. THE JOINT SHALL THEN BE COMPLETED BY FORCING THE PLAIN END TO THE BOTTOM OF THE

SOCKET WITH A FORKED TOOL OR JACK TYPE DEVICE. FIELD CUT PIPE SHALL HAVE THE END FILED TO MATCH THE MANUFACTURED SPIGOT END.

3.05 JOIN CONCRETE PIPE WITH RUBBER GASKETS INSTALLED AS RECOMMENDED BY THE MANUFACTURER.

3.06 JOIN POLYVINYLCHLORIDE (PVC) PIPE AS RECOMMENDED BY THE MANUFACTURER USING RUBBER RING GASKETS IN BELL JOINTS OR SOLVENT WELD AS APPLICABLE.

A. INSTALL PVC GRAVITY SEWER PIPE AND FITTINGS IN ACCORDANCE WITH ASTM D 2321 "UNDERGROUND INSTALLATION OF FLEXIBLE THERMOPLASTIC SEWER PIPE" AS IT RELATES TO CLASS I EMBEDMENT MATERIALS AND IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION. REFER TO STANDARD DETAILS IN THESE SPECIFICATIONS FOR ADDITIONAL BEDDING AND BACKFILL REQUIREMENTS. MAXIMUM DEPTH OF BURY FOR PVC SDR26 PVC PIPE IS 22 FEET TO THE TOP OF THE PIPE, MINIMUM COVER REQUIRED IS 3 FEET.

B. STORE PVC GRAVITY SEWER PIPE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS ON FLAT EVEN SURFACES AND MAINTAIN RACKED ON THE PALLETS AS DELIVERED TO THE JOB SITE UNTIL SUCH TIME AS THE TRENCH IS READY FOR PLACEMENT OF THE PIPE; I.E., PVC PIPE SHALL NOT BE STRUNG OUT ON THE JOB SITE. ANY PIPE DAMAGED AS A RESULT OF IMPROPER STORAGE SHALL NOT BE INSTALLED.

3.07 JOIN PIPE OF DIFFERENT MATERIALS BY A CONCRETE COLLAR, RETAINER GLAND OR FERNCO FLEXIBLE COUPLING. ALL FERNCO COUPLINGS SHALL BE BEDDED IN CONCRETE 4 INCHES THICK, EXTENDING TO SPRINGLINE OF THE FITTING, CONCRETE SHALL EXTEND FOR 6 INCHES ON EITHER EDGE OF FERNCO FITTING TO PROVIDE SUPPLEMENTAL SUPPORT ACROSS THE FLEXIBLE JOINT. PRICE FOR INSTALLING FERNCO SHALL INCLUDE THE COST FOR CONCRETE SUPPORT CRADLE.

3.08 CONSTRUCT MANHOLES USING PRECAST REINFORCED CONCRETE MANHOLE SECTIONS. MANHOLES SHALL BE INSTALLED VERTICALLY PLUMB WITH CONCRETE INVERT CHANNELS IN ACCORDANCE WITH STANDARD DETAILS. ALL LIFT RINGS SHALL BE REMOVED AND HOLES PLUGGED WITH NON-SHRINK GROUT. MANHOLE COVER FRAMES SHALL BE BOLTED TO MANHOLE WITH BOLTS IN ACCORDANCE WITH STANDARD DETAILS. BUTYL SEALANT SHALL BE INSTALLED BETWEEN THE FRAME AND THE CONE OR ADJUSTING RING. FRAME AND COVERS SHALL BE INSTALLED TO MATCH PLANNED FINISHED ELEVATION. ADJUSTMENTS SHALL BE MADE AS NECESSARY TO ACHIEVE FINISHED ELEVATION. THE USE OF GRADE ADJUSTMENT MATERIALS, (BRICK, CONCRETE AND IRON RINGS), SHALL BE MINIMIZED AND SHALL NOT EXCEED 12-INCHES ABOVE THE CONE OR FLAT TOP ASSEMBLY. CONES SHALL BE ROTATED SO THE MANHOLE FRAME AND COVER IS OUTSIDE WHEEL PATH WHEN MANHOLES ARE LOCATED IN ROADWAYS.

3.09 DROP MANHOLES SHALL BE CONSTRUCTED AS CALLED FOR ON PLANS, EXTERIOR DROPS ARE TO BE USED UNLESS UTILITY CONFLICTS DICTATE OTHERWISE. EXTERIOR DROP CONNECTIONS SHALL BE CONSTRUCTED OF DIP AND MECHANICAL JOINT FITTINGS. INTERIOR DROP CONNECTIONS SHALL CONSIST OF SCHEDULE 40 PVC PIPE WITH SOLVENT CEMENT JOINTS. THE ENTIRE STACK, INCLUDING ELBOW, VERTICAL SECTION OF PIPE AND TEE WITH AN OUTSTANDING OPEN-END TEE WITH PLUG, SHALL BE STRAPPED TO THE INSIDE WALL OF THE MANHOLE WITH STAINLESS STEEL BANDS LAGGED INTO WALL OF THE MANHOLE WITH STAINLESS STEEL EXPANSION BOLTS. A MINIMUM OF 2 STEEL BANDS SHALL BE INSTALLED AT A DISTANCE OF NO GREATER THAN 4 FEET ON CENTER. DROPS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DETAILS.

3.10 REHABILITATION OF EXISTING MANHOLE WITH WATERPROOF SEALER

A. PROVIDE ONE 1-INCH THICK COAT OF QUADEX QM-1S RESTORE TO ALL EXISTING MANHOLES INDICATED TO BE REHABILITATED BY WATERPROOFING.

FOLLOW MANUFACTURER'S RECOMMENDATION ON PREPARATION AND APPLICATION OF QM-1S RESTORE. PIPE TO MANHOLE CONNECTIONS SHALL BE REHABILITATED WITH WATER STOPPING CEMENT, WET-PLUG OR APPROVED EQUAL PRIOR TO MANHOLE REHABILITATION, OR WHEN MAKING NEW CONNECTIONS TO EXISTING BRICK OR BLOCK MANHOLES.

3.11 INSTALL DETECTABLE TAPE ACCORDING TO MANUFACTURER'S RECOMMENDATION IN TRENCH ABOVE NONMETALLIC PIPE.

3.12 STEEL AERIAL PIPE SHALL MEET THE LENGTH, THICKNESS, AND DIAMETER SHOWN ON THE PLANS AND IS TO BE JOINED BY WELDING. THE PIPE SHALL BE BEVELED AND PREPARED FOR FIELD WELDING AT THE CIRCUMFERENTIAL JOINTS. JOINING OF STEEL PIPE SHALL MEET THE REQUIREMENTS OF AWWA C206. PIPE SUPPORT PIERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DETAILS. KRAFT PAPER SHALL BE PLACED BETWEEN PIPE AND ALL POINTS OF CONTACT WITH CONCRETE AND STEEL STRAPS. UPON COMPLETION OF INSTALLATION, PAINT THE EXTERIOR OF THE PIPE WITH COAL TAR ENAMEL.

3.13 BORING, TUNNELING AND STEEL ENCASEMENT PIPE SHALL MEET THE LENGTH, THICKNESS AND DIAMETER AS SHOWN ON PLANS AND STANDARD DETAILS. THE CONTRACTOR SHALL SUBMIT COMPLETE DETAILS OF SHEETING, SHORING AND BRACING AND OTHER RELEVANT MATERIALS AND EQUIPMENT PERTINENT TO THE BORING AND TUNNELING OPERATION TO THE ENGINEER FOR APPROVAL. CONSTRUCTION SHALL BE EXECUTED IN SUCH A MANNER AS TO PREVENT SETTLEMENT OF THE GROUND SURFACE ABOVE THE PIPELINE. CASING AND TUNNEL LINER INSTALLATION SHALL FOLLOW THE HEAD EXCAVATION AS CLOSELY AS POSSIBLE. INSTALLATION SHALL BE IN ACCORDANCE WITH SECTION 302.03 OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS OR AREMA, AS APPLICABLE. JOINING OF STEEL CASING PIPE SHALL MEET THE REQUIREMENTS OF AWWA C206, STANDARDS FOR FIELD WELDING STEEL WATER PIPE JOINTS. CASING SHALL BE INSTALLED BY JACKING, BORING, OR OPEN CUTS AS INDICATED ON THE DRAWINGS. END ENCASEMENT, SPACING SPIDERS, AND DRAINAGE SHALL BE PROVIDED AS SHOWN ON STANDARD DETAILS.

3.14 TESTING GRAVITY SEWER LINES AND MANHOLES:

A. MANHOLE SHALL PASS A VISUAL AND VACUUM TEST ACCORDING TO THE FOLLOWING PROCEDURES. THE TEST SHALL BE MADE USING AN INFLATABLE COMPRESSION BAND, VACUUM PUMP, AND APPURTENANCES SPECIFICALLY DESIGNED FOR VACUUM TESTING MANHOLES. TEST PROCEDURES SHALL BE IN ACCORDANCE WITH ASTM C 1244 EXCEPT THE MORE RESTRICTIVE REQUIREMENT IN (3) AS INDICATED BELOW. EQUIPMENT SHALL BE MANUFACTURED BY PETER A. GLAZIER & ASSOCIATES, WORCHESTER, MASSACHUSETTS.

(1) MANHOLES MAY BE TESTED BY VACUUM TEST IMMEDIATELY AFTER ASSEMBLY OF THE MANHOLE, FRAMES, AND CONNECTING PIPES AND BEFORE ANY BACKFILL IS PLACED AROUND THE MANHOLES. HOWEVER, FINAL ACCEPTANCE SHALL BE BASED ONLY UPON A TEST AFTER THE MANHOLE IS BACKFILLED AND THE COVER FRAME CASTINGS ARE SET IN PLACE. TEST SHALL INCLUDE ASSESSMENT OF FRAME SEAL TO MANHOLE RISER.

(2) ALL LIFT HOLES SHALL BE PLUGGED WITH NONSHRINK GROUT AND ALL PIPES SHALL BE PLUGGED, TAKING CARE TO SECURELY BRACE THE PLUGS AND PIPE. PLUGS SHALL BE TIED TO AN IMMOBILE OBJECT.

(3) AFTER THE TESTING EQUIPMENT IS IN PLACE, A VACUUM OF 10 INCHES OF HG SHALL BE DRAWN ON THE MANHOLE. THE MANHOLE WILL BE CONSIDERED TO HAVE PASSED THE TEST IF THE VACUUM DOES NOT DROP

MORE THAN 1 INCH OF HG WITHIN 60 SECONDS FOR MANHOLES 7 FEET IN DEPTH OR LESS AND 90 SECONDS FOR MANHOLES OVER 7 FEET DEEP. ADD AN ADDITIONAL 15 SECONDS TO THESE TIMES FOR TESTING 60-INCH MANHOLES AND 30 SECONDS TO THESE TIMES FOR TESTING 72-INCH MANHOLES.

(4) IF THE MANHOLE FAILS THE INITIAL TEST, THE CONTRACTOR SHALL LOCATE THE LEAKAGE AND MAKE PROPER REPAIRS. LEAKS SHALL BE REPAIRED ON THE OUTSIDE OF THE MANHOLE UNLESS APPROVED OTHERWISE, AND THEN RETESTED UNTIL A SATISFACTORY TEST RESULT IS OBTAINED. IF JOINT MASTIC MATERIAL IS COMPLETELY PULLED OUT DURING THE VACUUM TEST, THE MANHOLE SHALL BE DISASSEMBLED AND THE MASTIC REPLACED.

(5) AFTER THE MANHOLES HAVE BEEN BACKFILLED AND THE COVER FRAME CASTING SEALED IN PLACE, AND PRIOR TO FINAL ACCEPTANCE OF THE PROJECT, ANY SIGNS OF LEAKS OR WEEPING VISIBLE FROM THE INSIDE OF THE MANHOLE SHALL BE REPAIRED AND THE MANHOLE MADE WATERTIGHT AND TESTED.

B. TEST FOR LEAKAGE OF INSTALLED GRAVITY SEWERS BY LOW PRESSURE AIR TEST, EXFILTRATION, OR INFILTRATION TEST AS APPROVED AND TO THE SATISFACTION OF THE ENGINEER. TESTS SHALL BE CONDUCTED ON SHORT SECTIONS OF SEWER LINE; I.E., BETWEEN MANHOLES OR AT THE END OF EACH DAY'S WORK. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIAL, TOOLS, AND EQUIPMENT NECESSARY TO MAKE THE TESTS. EQUIPMENT AND METHODS USED SHALL BE ACCEPTABLE TO THE ENGINEER. MONITORING GAGES SHALL BE SUBJECT TO CALIBRATION IF DEEMED NECESSARY BY THE ENGINEER. SEWER LINES, REGARDLESS OF SIZE, THAT CROSS UNDER OR OVER STREAMS SHALL BE TESTED FOR AND EXHIBIT ZERO INFILTRATION. IF ANY PART OF THE SEWER LINE FAILS THE LEAKAGE TEST, THE PROBLEM SHALL BE CORRECTED BY THE CONTRACTOR. IF THE PROBLEM IS FOUND AT PIPE JOINTS THEN THE AFFECTED JOINTS SHALL BE PRESSURE GROUTED. ALL NEW LATERALS SHALL BE TESTED ALONG WITH THE SEWER LINE.

C. LOW PRESSURE AIR TESTS MAY ONLY BE USED ON PIPE DIAMETERS 12 INCHES OR LESS AND SHALL COMPLY WITH APPROPRIATE ASTM STANDARD.

(1) IF THE PIPE TO BE TESTED IS SUBMERGED IN GROUNDWATER, THE TEST PRESSURE SHALL BE INCREASED 1.0 PSI FOR EVERY 2.31 FEET THE GROUNDWATER LEVEL IS ABOVE THE INVERT OF THE SEWER. TO DETERMINE GROUNDWATER LEVEL, THE CONTRACTOR SHALL INSTALL A 4-INCH PVC PIPE ON THE OUTSIDE OF THE MANHOLE FROM THE BASE OF THE MANHOLE TO ABOVE GROUND LEVEL. THE BOTTOM OF THIS PIPE SHALL BE PLACED IN A MINIMUM OF 18 INCHES OF PIPE BEDDING MATERIAL TO ALLOW GROUNDWATER TO ENTER THE BOTTOM OF THE PIPE. IMMEDIATELY PRIOR TO THE LINE TEST, THE GROUNDWATER ELEVATION SHALL BE DETERMINED BY MEASURING DOWN TO THE SURFACE OF THE WATER IN THE PVC PIPE FROM GROUND LEVEL. THE PVC PIPE SHALL BE CUT OFF BELOW GRADE AND CAPPED OR FILLED AFTER AN ACCEPTABLE TEST HAS BEEN OBTAINED.

(2) OTHER METHODS OF DETERMINING GROUNDWATER LEVEL MAY BE USED SUBJECT TO APPROVAL OF THE ENGINEER.

(3) IT IS EXTREMELY IMPORTANT THAT THE VARIOUS PLUGS BE INSTALLED AND BRACED IN SUCH A WAY AS TO PREVENT BLOWOUTS. INASMUCH AS A FORCE OF 250 POUNDS (1112N) IS EXERTED ON AN 8-INCH (203-MILLIMETER) PLUG BY AN INTERNAL PIPE PRESSURE OF 5 PSI (34 KPA), IT SHOULD BE REALIZED THAT SUDDEN EXPULSION OF A POORLY

INSTALLED PLUG OR OF A PLUG THAT IS PARTIALLY DEFLATED BEFORE THE PIPE PRESSURE IS RELEASED CAN BE DANGEROUS.

AS A SAFETY PRECAUTION, PRESSURIZING EQUIPMENT SHALL INCLUDE A REGULATOR OR RELIEF VALVE SET AT 10 PSI (69 KPA) TO AVOID OVER-PRESSURIZING AND DAMAGING AN OTHERWISE ACCEPTABLE LINE. NO ONE SHALL BE ALLOWED IN THE MANHOLES DURING TESTING. ALL PLUGS SHALL BE SECURED WITH TETHERS TO IMMOBILE OBJECT TO INSURE THEY ARE NOT FLUSHED DOWNSTREAM AS THEY ARE REMOVED.

(4) TABLES: AIR TEST TABLES AT THE END OF THIS SECTION WERE PREPARED IN ACCORDANCE WITH ASTM C 924 (CONCRETE PIPE) AND F1417.92 (PLASTIC PIPE) FORMULAS.

D. SAFETY AND OPERATION PROCEDURES RECOMMENDED BY THE EQUIPMENT MANUFACTURER SHALL BE REVIEWED AND ADHERED TO AT ALL TIMES.

E. ALLOWABLE LEAKAGE OF PIPE USING INFILTRATION/EXFILTRATION TEST SHALL BE LIMITED TO 100 GALLONS PER DAY PER INCH DIAMETER PER MILE OR 2,400 GALLONS PER DAY, WHICHEVER IS LESS. IF GROUNDWATER IS 4 FEET ABOVE TOP OF PIPE, USE INFILTRATION TEST. IF GROUNDWATER IS LESS THAN 4 FEET ABOVE TOP OF PIPE, FILL PIPE AND UPSTREAM MANHOLE TO PRODUCE A MINIMUM 4-FOOT HEAD OVER THE TOP OF PIPE, LET STAND FOR 12 HOURS, REFILL MANHOLE TO ORIGINAL LEVEL, AND CONDUCT EXFILTRATION TEST FOR 1 HOUR.

F. UPON COMPLETION OF INSTALLATION AND TESTING THE ENGINEER MAY INSPECT THE WORK IN WHOLE OR IN PART AND MAKE SUCH TESTS AS NECESSARY TO ENSURE EVERY PORTION OF THE CONTRACT REQUIREMENTS HAVE BEEN FAITHFULLY CARRIED OUT. IF DEFECTS ARE SUSPECTED THE ENGINEER MAY REQUIRE WORK TO BE UNCOVERED FOR INSPECTION AND/OR TESTING AT CONTRACTOR EXPENSE. IF NO DEFECTS ARE FOUND, OR DEFECTS WERE NOT THE DUE TO THE CONTRACTOR'S OPERATIONS, EXPENSES SHALL BE REIMBURSED IN ACCORDANCE WITH THE CONTRACT PROVISIONS.

3.15 SEWER LINES DESIGNATED TO BE LEFT IN PLACE AND ABANDONED SHALL BE PLUGGED AT THE LOWER END AND FILLED WITH FLOWABLE FILL PUMPED INTO THE LINE UNTIL IT IS COMPLETELY FILLED. MANHOLES TO BE ABANDONED SHALL HAVE ALL PIPE CONNECTIONS PLUGGED WITH A 12-INCH THICK PLUG OF CLASS A3 CONCRETE, THEN THE MANHOLE FILLED WITH COMPACTED COARSE AGGREGATE TO GRADE IF IN A PAVED AREA, OR 18-INCHES BELOW GRADE IF OFF ROAD. THE REMAINING HEIGHT IN OFF ROAD AREAS IS TO BE FILLED WITH CLEAN EARTH FILL TO MATCH SURROUNDING GRADE. EARTH FILL SHALL BE LAID ON A LAYER OF AASHTO TYPE III GRADE SEPARATION AND STABILIZATION GEOTEXTILE LAID OVER THE STONE.

AIR TEST TABLE CONCRETE GRAVITY SEWER PIPE
BASED ON ASTM C 924

MINIMUM TEST TIME IN MINUTES: SECONDS FOR PRESSURE DROP FROM 3.5 TO 2.5 PSIG

CONCRETE PIPE DIAMETER D (IN)	MINIMUM SPECIFIED TIME (T) REQUIRED FOR 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF CONCRETE PIPE INDICATED SPECIFICATION TIME FOR LENGTH SHOWN (MIN:SEC)										
	10 FT	50 FT	100 FT	150 FT	200 FT	250 FT	300 FT	350 FT	400 FT	450 FT	500 FT
6	0:04	0:21	0:42	1:03	1:24	1:45	2:06	2:27	2:48	3:09	3:30
8	0:07	0:36	1:12	1:48	2:24	3:00	3:36	4:12	4:48	5:24	6:00
10	0:09	0:45	1:30	2:15	3:00	3:45	4:30	5:15	6:00	6:45	7:30
12	0:11	0:54	1:48	2:42	3:36	4:30	5:24	6:18	7:12	8:06	9:00

AIR TEST TABLE PVC GRAVITY SEWER
BASED ON ASTM F1417.92 (1998)

MINIMUM TEST TIME IN MINUTES: SECONDS FOR PRESSURE DROP FROM 3.5 TO 2.5 PSIG

PLASTIC PIPE DIAMETER D (IN)	MINIMUM TIME T (MIN:SEC)	LENGTH FOR MINIMUM TIME L (FT)	TIME FOR LONGER LENGTH (SEC)	MINIMUM SPECIFIED TIME (T) REQUIRED FOR 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PVC PIPE INDICATED ALLOWABLE LEAKAGE Q = 0.0015 CFT/MIN. PER SQ.FT. OF INTERNAL PIPE SURFACE AREA T = 0.085DK/Q K=0.000419DL FOR K > 1, OTHERWISE K=1 SPECIFICATION TIME FOR LENGTH SHOWN (MIN:SEC)						
				100 FT	150 FT	200 FT	250 FT	300 FT	350 FT	400 FT
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47

ABOVE TABLE BASED ON UNI-BELL PVC PIPE ASSOCIATION, "RECOMMENDED PRACTICE FOR LOW-PRESSURE AIR TESTING OF INSTALLED SEWER PIPE", STANDARD UNI-B-6-98 AND METHODS OF ASTM F1417.92 (1998). REFERENCE UNI-B-6-98 FOR COMPUTATION OF TEST TIMES WHERE LATERAL SEWERS NEED TO BE CONSIDERED DURING TESTING.

END OF SECTION

SECTION 02750 - SEWER LINE CLEANING

1. GENERAL

1.01 DESCRIPTION: SEWER LINES TO RECEIVE A LINER SHALL BE CLEANED. THE SEWER LINE CLEANING SHALL REMOVE FOREIGN MATERIALS FROM THE LINES AND RESTORE THE SEWER TO A MINIMUM OF 95 PERCENT OF THE ORIGINAL CARRYING CAPACITY OR AS REQUIRED FOR PROPER SEATING OF AN INTERNAL PIPE LINER. IT IS RECOGNIZED THAT THERE ARE SOME CONDITIONS SUCH AS BROKEN PIPE AND MAJOR BLOCKAGES THAT PREVENT CLEANING FROM BEING ACCOMPLISHED OR WHERE ADDITIONAL DAMAGE WOULD RESULT IF CLEANING WERE ATTEMPTED OR CONTINUED. SHOULD SUCH CONDITIONS BE ENCOUNTERED, THE CONTRACTOR WILL NOT BE REQUIRED TO CLEAN THOSE SPECIFIC SECTIONS. IF IN THE COURSE OF NORMAL CLEANING OPERATIONS, DAMAGE DOES RESULT FROM PRE-EXISTING AND UNFORESEEN CONDITIONS SUCH AS BROKEN PIPE, THE CONTRACTOR WILL NOT BE HELD RESPONSIBLE.

1.02 SUBMIT WRITTEN DESCRIPTION OF CLEANING PROCEDURE AND ALL EQUIPMENT TO BE USED.

2. EQUIPMENT

2.01 HIGH-VELOCITY JET (HYDROCLEANING) EQUIPMENT: ALL HIGH-VELOCITY SEWER CLEANING EQUIPMENT SHALL BE CONSTRUCTED FOR EASE AND SAFETY OF OPERATION. THE EQUIPMENT SHALL HAVE A SELECTION OF TWO OR MORE HIGH-VELOCITY NOZZLES. THE NOZZLES SHALL BE CAPABLE OF PRODUCING A SCOURING ACTION FROM 15 TO 45 DEGREES IN ALL SIZE LINES DESIGNATED TO BE CLEANED. EQUIPMENT SHALL ALSO INCLUDE A HIGH-VELOCITY GUN FOR WASHING AND SCOURING MANHOLE WALLS AND FLOOR. THE GUN SHALL BE CAPABLE OF PRODUCING FLOWS FROM A FINE SPRAY TO A SOLID STREAM. THE EQUIPMENT SHALL CARRY ITS OWN WATER TANK, AUXILIARY ENGINES, PUMPS, AND HYDRAULICALLY DRIVEN HOSE REEL.

2.02 CLEANING PRECAUTIONS: DURING SEWER CLEANING OPERATIONS, SATISFACTORY PRECAUTIONS SHALL BE TAKEN IN THE USE OF CLEANING EQUIPMENT TO INSURE THAT THE WATER PRESSURE CREATED DOES NOT DAMAGE OR CAUSE FLOODING OF PROPERTY OR BUILDINGS BEING SERVED BY THE SEWER.

3. EXECUTION

3.01 SEWER CLEANING: THE DESIGNATED SEWER SECTIONS SHALL BE CLEANED USING HIGH-VELOCITY JET EQUIPMENT. THE EQUIPMENT SHALL BE CAPABLE OF REMOVING DIRT, GREASE, ROCKS, SAND, AND OTHER MATERIALS AND OBSTRUCTIONS FROM THE SEWER LINES AND MANHOLES. IF CLEANING OF AN ENTIRE SECTION CANNOT BE SUCCESSFULLY PERFORMED FROM ONE MANHOLE, THE EQUIPMENT SHALL BE SET UP ON THE OTHER MANHOLE AND CLEANING AGAIN ATTEMPTED. IF, AGAIN, SUCCESSFUL CLEANING CANNOT BE PERFORMED OR THE EQUIPMENT FAILS TO TRAVERSE THE ENTIRE SECTION, IT WILL BE ASSUMED THAT A MAJOR BLOCKAGE EXISTS AND THE CLEANING EFFORT SHALL BE ABANDONED.

3.02 ROOT REMOVAL: ROOTS SHALL BE REMOVED IN THE SECTIONS WHERE ROOT INTRUSION IS A PROBLEM. SPECIAL ATTENTION SHOULD BE USED DURING THE CLEANING OPERATION TO ASSURE ALMOST COMPLETE REMOVAL OF ROOTS FROM THE JOINTS. ROOTS WHICH COULD PREVENT INSTALLATION OF A PIPE LINER SHALL BE REMOVED. PROCEDURES MAY INCLUDE THE USE OF MECHANICAL EQUIPMENT SUCH AS RODDING MACHINES, BUCKET MACHINES, AND WINCHES USING ROOT CUTTERS AND PORCUPINES, AND EQUIPMENT SUCH AS HIGH-VELOCITY JET CLEANERS.

3.03 MATERIAL REMOVAL: SLUDGE, DIRT, SAND, ROCKS, GREASE, AND OTHER SOLID OR SEMISOLID MATERIAL RESULTING FROM THE CLEANING OPERATION SHALL BE CAPTURED AND REMOVED AT THE DOWNSTREAM MANHOLE OF THE SECTION BEING CLEANED, LOADED IN A SUITABLE CONTAINER, TRANSPORTED TO THE NEAREST WASTEWATER TREATMENT FACILITY, AND DISPOSED OF AT THAT FACILITY IN ACCORDANCE WITH ALL REQUIREMENTS AND CHARGES.

3.04 CLEANING WATER DISPOSAL: WATER USED TO CLEAN THE SEWER LINES SHALL BE DISCHARGED INTO THE SANITARY SEWER DOWNSTREAM OF THE CLEANING OPERATION. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR DISCHARGE WATER USED TO CLEAN SEWER LINES ONTO THE GROUND OR INTO STREAMS.

3.05 FINAL ACCEPTANCE: ACCEPTANCE OF SEWER LINE CLEANING SHALL BE MADE UPON THE SUCCESSFUL COMPLETION OF THE TELEVISION INSPECTION AND SHALL BE TO THE SATISFACTION OF THE ENGINEER. IF TV INSPECTION SHOWS THE CLEANING TO BE UNSATISFACTORY, THE CONTRACTOR SHALL BE REQUIRED TO RECLEAN AND REINSPECT THE SEWER LINE UNTIL THE CLEANING IS SHOWN TO BE SATISFACTORY.

3.06 ALL NEW SEWERS SHALL BE CLEANED PRIOR TO BEING PLACED IN SERVICE AS DIRECTED BY THE ENGINEER TO INCLUDE CAPTURE OF DEBRIS AT ADJACENT DOWNSTREAM MANHOLE, REMOVAL AND DISPOSAL OF DEBRIS.

END OF SECTION

SECTION 02760 - TELEVISION INSPECTION OF SEWER LINES

1. GENERAL

1.01 AFTER CLEANING SEWER LINES TO RECEIVE A LINER AND AFTER INSTALLATION OF THE LINER, THE DESIGNATED SECTIONS SHALL BE VISUALLY INSPECTED BY MEANS OF CLOSED-CIRCUIT TELEVISION. THE INSPECTION SHALL BE DONE ONE SECTION AT A TIME.

1.02 SUBMIT A WRITTEN DESCRIPTION OF PROCEDURES TO BE USED.

2. EQUIPMENT

2.01 THE TELEVISION CAMERA USED FOR THE INSPECTION SHALL BE ONE SPECIFICALLY DESIGNED AND CONSTRUCTED FOR SUCH INSPECTION. LIGHTING FOR THE CAMERA SHALL BE SUITABLE TO ALLOW A CLEAR PICTURE OF THE ENTIRE PERIPHERY OF THE PIPE. THE CAMERA SHALL BE OPERATIVE IN 100 PERCENT HUMIDITY CONDITIONS. THE CAMERA, TELEVISION MONITOR, AND OTHER COMPONENTS OF THE VIDEO SYSTEM SHALL BE CAPABLE OF PRODUCING PICTURE QUALITY TO THE SATISFACTION OF THE ENGINEER; AND IF UNSATISFACTORY, EQUIPMENT SHALL BE REMOVED AND NO PAYMENT WILL BE MADE FOR AN UNSATISFACTORY INSPECTION.

3. EXECUTION

3.01 MOVE THE CAMERA THROUGH THE LINE IN EITHER DIRECTION AT A MODERATE RATE, STOPPING WHEN NECESSARY TO PERMIT PROPER DOCUMENTATION OF THE SEWER'S CONDITION. IN NO CASE PULL TELEVISION CAMERA AT A SPEED GREATER THAN 30 FEET PER MINUTE. USE MANUAL WINCHES, POWER WINCHES, TV CABLE, AND POWERED REWINDS OR OTHER DEVICES THAT DO NOT OBSTRUCT THE CAMERA VIEW OR INTERFERE WITH PROPER DOCUMENTATION OF THE SEWER CONDITIONS TO MOVE THE CAMERA THROUGH THE SEWER LINE. IF, DURING THE INSPECTION OPERATION, THE TELEVISION CAMERA WILL NOT PASS THROUGH THE ENTIRE SECTION, SET UP EQUIPMENT SO THAT THE INSPECTION CAN BE PERFORMED FROM THE OPPOSITE MANHOLE. IF, AGAIN, THE CAMERA FAILS TO PASS THROUGH THE ENTIRE SECTION, THE OBSTRUCTION SHALL BE CLEARED BY CLEANING, ROOT REMOVAL, OR POINT REPAIR AS DIRECTED BY THE ENGINEER AND THE SECTION REINSPECTED.

3.02 WHEN MANUALLY OPERATED WINCHES ARE USED TO PULL THE TELEVISION CAMERA THROUGH THE LINE, SET UP TELEPHONES OR OTHER SUITABLE MEANS OF COMMUNICATION BETWEEN THE TWO MANHOLES OF THE SECTION BEING INSPECTED TO INSURE GOOD COMMUNICATIONS BETWEEN MEMBERS OF THE CREW.

3.03 THE IMPORTANCE OF ACCURATE DISTANCE MEASUREMENTS IS EMPHASIZED. MEASUREMENT FOR LOCATION OF DEFECTS SHALL BE ABOVEGROUND BY MEANS OF A METER DEVICE. MARKING ON THE CABLE, OR THE LIKE, WHICH WOULD REQUIRE INTERPOLATION FOR DEPTH OF MANHOLE, WILL NOT BE ALLOWED. CHECK ACCURACY OF THE DISTANCE METER BY USE OF A WALKING METER, ROLL-A-TAPE, OR OTHER SUITABLE DEVICE. THE ACCURACY SHALL BE SATISFACTORY TO THE ENGINEER.

3.04 DOCUMENTATION OF THE TELEVISION RESULTS SHALL BE AS FOLLOWS:

A. TELEVISION INSPECTION LOGS: KEEP PRINTED LOCATION RECORDS THAT CLEARLY SHOW THE LOCATION IN RELATION TO AN ADJACENT MANHOLE OF EACH INFILTRATION POINT OBSERVED DURING INSPECTION. IN ADDITION, RECORD OTHER POINTS OF SIGNIFICANCE SUCH AS LOCATIONS OF BUILDING SEWERS, UNUSUAL CONDITIONS, ROOTS, STORM SEWER CONNECTIONS, BROKEN PIPE, PRESENCE OF SCALE AND CORROSION, AND OTHER DISCERNIBLE FEATURES. SUPPLY A COPY OF SUCH RECORDS TO THE OWNER.

B. PHOTOGRAPHS: MAKE INSTANT DEVELOPING, 35 MM, OR OTHER STANDARD-SIZE PHOTOGRAPHS OF THE TELEVISION PICTURE OF PROBLEMS UPON REQUEST OF THE ENGINEER, AS LONG AS SUCH PHOTOGRAPHING DOES NOT INTERFERE WITH THE CONTRACTOR'S OPERATIONS.

C. VIDEOTAPE RECORDINGS: PROVIDE THE OWNER WITH TWO COPIES OF A VISUAL AND AUDIO RECORD OF ALL AREAS OF THE LINES THAT MAY BE REPLAYED.

END OF SECTION

SECTION 02770 - SEWER FLOW CONTROL

1. GENERAL

1.01 FOR LINING, TELEVISING, OR REPLACING EXISTING SEWERS, THE FLOW IN THE SECTION BEING WORKED SHALL BE BYPASSED USING PUMPS.

1.02 FOR TELEVISION INSPECTION OF SEWER LINES, THE DEPTH OF FLOW OF THE SECTION BEING WORKED SHALL BE REDUCED, PLUGGED OR BLOCKED, OR BYPASSED USING PUMPS.

1.03 DEPTH OF FLOW SHALL NOT EXCEED THAT SHOWN BELOW FOR THE RESPECTIVE PIPE SIZES AS MEASURED IN THE MANHOLE WHEN PERFORMING TELEVISION INSPECTION.

A. 6-INCH - 10-INCH PIPE.....20% OF PIPE DIAMETER

B. 12-INCH - 24-INCH PIPE.....25% OF PIPE DIAMETER

1.04 FLOW CONTROL PRECAUTIONS: WHEN FLOW IN A SEWER LINE IS PLUGGED, BLOCKED, OR BYPASSED, SUFFICIENT PRECAUTIONS SHALL BE TAKEN TO PROTECT THE SEWER LINES FROM DAMAGE THAT MIGHT RESULT FROM SEWER SURCHARGING.

1.05 SUBMIT WRITTEN DESCRIPTION OF FLOW CONTROL AND ALL EQUIPMENT TO BE USED.

2. MATERIALS: NOT USED

3. EXECUTION

3.01 PLUGGING OR BLOCKING: A SEWER LINE PLUG SHALL BE INSERTED INTO THE LINE UPSTREAM OF THE SECTION BEING WORKED. THE PLUG SHALL BE SO DESIGNED THAT ALL OR ANY PORTION OF THE SEWAGE CAN BE RELEASED. DURING TV INSPECTION, FLOW SHALL BE REDUCED TO WITHIN THE LIMITS SPECIFIED ABOVE. AFTER THE WORK HAS BEEN COMPLETED, FLOW SHALL BE RESTORED TO NORMAL.

3.02 PUMPING AND BYPASSING: WHEN PUMPING AND BYPASSING ARE REQUIRED, PROVIDE THE PUMPS, CONDUITS, AND OTHER EQUIPMENT TO DIVERT THE FLOW OF SEWAGE AROUND THE SECTION IN WHICH WORK IS TO BE PERFORMED. THE BYPASS SYSTEM SHALL BE OF SUFFICIENT CAPACITY TO HANDLE 1.25 TIMES THE MAXIMUM GRAVITY FLOW OF THE PIPELINE SECTION BEING BYPASSED. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY LABOR AND EQUIPMENT TO SETUP AND OPERATE THE EQUIPMENT IN A MANNER TO PREVENT ALL SPILLS, OVERFLOWS, AND RELEASES. THIS SHALL INCLUDE MANNING THE EQUIPMENT CONTINUOUSLY OR PROVIDING AUTO-DIALER EQUIPPED MACHINERY FOR FAIL SAFE OPERATION. ALL PUMPS SHALL BE EQUIPPED WITH SOUND ATTENUATION MEASURES WHICH REDUCE NOISE LEVELS TO MAXIMUM OF 75 DECIBELS AT A DISTANCE OF 30 FEET FROM THE EQUIPMENT DURING ALL PERIODS OF OPERATION.

3.03 PLUGGED OR BY-PASSED SEWER LINES SHALL NOT BE ALLOWED TO OVERFLOW OR DISCHARGE ONTO THE GROUND OR INTO STREAMS EXCEPT DURING RAINFALL EVENTS THAT WOULD NORMALLY ACTIVATE A PERMITTED COMBINED SEWER OVERFLOW.

END OF SECTION

SECTION 02780 - LINER FOR SEWER REHABILITATION

1. GENERAL

1.01 DESCRIPTION: THE WORK TO BE PERFORMED SHALL CONSIST OF THE REHABILITATION OF EXISTING SANITARY SEWER PIPE BY THE CURED-IN-PLACE PIPE (CIPP) PROCESS OR FOLD AND FORM (FF) PROCESS WITH THE INSTALLATION OF A FLEXIBLE LINER INTO THE EXISTING SANITARY SEWER MAIN. PROVIDE ALL WORK AND MATERIALS TO PERFORM THE FOLLOWING:

A. CLEAN ALL SEWER SECTIONS DESIGNATED FOR REHABILITATION USING HIGH-VELOCITY WATER JET EQUIPMENT IN ACCORDANCE WITH SECTION 02750.

B. PERFORM A TELEVISION INSPECTION OF THE DESIGNATED SEWER SECTIONS BEFORE AND AFTER THE REHABILITATION PROCESS IN ACCORDANCE WITH SECTION 02760.

C. PROVIDE BYPASS PUMPING OF FLOW AROUND ALL SEWER SECTIONS BEING REHABILITATED IN ACCORDANCE WITH SECTION 02770.

D. REMOVE OBSTRUCTIONS AND INTRUDING SERVICE LATERALS.

E. REHABILITATE EXISTING SANITARY SEWERS USING THE CIPP PROCESS OR FF PROCESS.

F. PERFORM ALL WORK NECESSARY TO RECONNECT SEWER LATERALS.

1.02 SAFETY: THE CONTRACTOR SHALL CARRY OUT HIS OPERATIONS IN STRICT ACCORDANCE WITH ALL APPLICABLE OSHA STANDARDS. PARTICULAR ATTENTION IS DRAWN TO THOSE SAFETY REQUIREMENTS INVOLVING WORKING WITH SCAFFOLDING AND ENTERING CONFINED SPACES.

1.03 REFERENCE STANDARDS ARE REFERRED TO BY ABBREVIATIONS AS FOLLOWS:

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS.....ASTM

1.04 THE LINER SHALL BE FABRICATED TO A SIZE AND LENGTH THAT, WHEN INSTALLED, SHALL NEATLY FIT THE INTERNAL CIRCUMFERENCE OF THE SEWER LINE SECTION TO BE LINED AS SHOWN ON THE DRAWINGS OR AS DETERMINED BY THE TELEVISED INSPECTION. ALLOWANCE SHALL BE GIVEN FOR EXCESS PIPE (RIB) WHEN THE CROSS-SECTIONAL AREAS HAVE BEEN REDUCED DUE TO OFFSET JOINTS, PARTIAL COLLAPSE, OUT OF ROUND SECTIONS, AND THE LIKE.

1.05 SUBMIT WRITTEN DESCRIPTION OF PROCEDURES, EQUIPMENT, AND PRODUCTS TO BE USED AND CERTIFIED COPIES OF TEST REPORTS THAT INDICATE THE APPLICABLE STANDARDS HAVE BEEN MET.

1.06 THE CONTRACTOR SHALL COMPLETELY REMOVE AND DISPOSE OF ALL DIRT, DEBRIS, RUBBISH AND SURPLUS, AND UNSUITABLE MATERIALS AT THE END OF EACH WORK DAY AT NO ADDITIONAL COST TO THE OWNER.

1.07 WHENEVER THE CONTRACTOR DESIRES TO USE A HYDRANT FOR WATER SUPPLY, THE CONTRACTOR SHALL OBTAIN THE PERMISSION OF THE OWNER. ALL COSTS ASSOCIATED WITH THE USE OF WATER SUPPLIED FROM HYDRANTS SHALL NOT BE PAID FOR SEPARATELY BUT SHALL BE DEEMED TO BE INCLUDED IN THE BID.

2. PRODUCTS

2.01 MATERIALS FOR CURED-IN-PLACE PROCESS

A. THE CURED-IN-PLACE PIPE PROCESS SHALL CONSIST OF A FLEXIBLE TUBE OR LINER THAT HAS BEEN IMPREGNATED WITH A THERMOSETTING RESIN, WHICH IS RESISTANT TO ATTACK BY NORMAL COMPONENTS OF DOMESTIC SEWAGE. THE RESIN SHALL BE THERMALLY CURED TO FORM A HARD IMPERMEABLE PIPE, WHICH CONFORMS TO THE FOLLOWING MINIMUM VALUES WHEN TESTED IN ACCORDANCE WITH ASTM F 1216.

FLEXURAL STRESS	4,500 PSI	ASTM D 790 MOD.
FLEXURAL MODULUS OF ELASTICITY	250,000 PSI	ASTM D 790 MOD.

B. THE LINER THICKNESS SHALL BE BASED ON THE FOLLOWING PHYSICAL CONDITIONS OF THE EXISTING SANITARY SEWER PIPE.

(1) PIPES SHALL BE CONSIDERED FULLY DETERIORATED.

(2) PIPES SHALL BE SUBJECT TO FULL SOIL LOAD OF 120 POUNDS/CF, APPLICABLE LIVE LOAD, AND WATER TABLE 5 FEET BELOW GROUND.

(3) PIPES SHALL BE CONSIDERED TO HAVE A MINIMUM OF 2 PERCENT OVALITY IN THE CIRCUMFERENCE.

C. BASED ON THE ABOVE PHYSICAL CONDITIONS, THE LINER SHALL HAVE THE FOLLOWING MINIMUM THICKNESS IN MILLIMETERS IN ACCORDANCE WITH ASTM F 1216 UNLESS MODIFIED BY THE ENGINEER BASED ON FIELD INFORMATION AND CALCULATIONS SUBMITTED BY THE CONTRACTOR.

	PIPE INVERT DEPTH		
NORMAL PIPE SIZE (INCHES)	UP TO 10 FT. (MILLIMETERS)	10 FT. TO 15 FT. (MILLIMETERS)	15 FT. AND UP (MILLIMETERS)
6	4.5	4.5	4.5
8	6.0	6.0	6.0
10	6.0	6.0	7.5
12	6.0	7.5	9.0
15	7.5	9.0	10.0
18	9.0	12.0	13.5
21	10.5	13.5	15.0
24	12.0	15.0	16.5

D. ACCEPTABLE CURED-IN-PLACE PROCESS SHALL BE "INSITUFORM," OR "MASTERLINER" AND SHALL BE FURNISHED AND INSTALLED BY A LICENSED CONTRACTOR FOR THE RESPECTIVE PROCESS.

2.02 MATERIALS FOR FOLD AND FORM PROCESS

A. THE SEWER LINER PIPE AND FITTINGS SHALL BE MANUFACTURED FROM THE FOLLOWING:

(1) HIGH DENSITY POLYETHYLENE PIPE COMPOUND WHICH CONFORMS TO ASTM D 1248 AND MEETS THE REQUIREMENTS FOR TYPE PE34, CLASS C PRODUCT. PIPE MADE FROM THIS COMPOUND SHALL HAVE A LONG-TERM HYDROSTATIC STRENGTH RATING OF 1,600 PSI OR MORE, IN ACCORDANCE WITH ASTM D 2837. WHEN THE ENVIRONMENTAL STRESS CRACK RESISTANCE (ESCR) OF

THE COMPOUND IS MEASURED IN ACCORDANCE WITH ASTM D 1693, CONDITION C, THE COMPOUND SHALL WITHSTAND NOT LESS THAN 192 HOURS IN 100 PERCENT SOLUTION IGEPAL CO-630 AT 100 DEGREES F BEFORE REACHING A 20 PERCENT FAILURE POINT (F20).

(2) POLYVINYL CHLORIDE ALLOY PIPE COMPOUND WHICH CONFORMS TO ASTM D 1784 CELL CLASSIFICATION 12111-C, 12344-B, OR 12334-B. PIPE MADE FROM THIS COMPOUND SHALL HAVE A LONG-TERM HYDROSTATIC STRENGTH RATING OF 1,600 PSI OR MORE, IN ACCORDANCE WITH ASTM D 2837.

B. PHYSICAL STRENGTH: THE LINER PIPE SHALL CONFORM TO THE MINIMUM STRUCTURAL STANDARDS, AS LISTED BELOW:

U.S. STANDARD	RESULTS	
FLEXURAL STRESS (YIELD)	ASTM D 638	3,300 PSI
FLEXURAL STRESS (BREAK)	ASTM D 638	4,500 PSI
FLEXURAL MODULUS OF ELASTICITY	ASTM D 790	145,000 PSI

C. HIGH DENSITY POLYETHYLENE LINER MATERIAL TESTS: TESTS FOR COMPLIANCE WITH THIS SPECIFICATION SHALL BE MADE ACCORDING TO ASTM F 1533. A CERTIFICATE OF COMPLIANCE WITH THIS SPECIFICATION SHALL BE PROVIDED BY THE MANUFACTURER FOR ALL HIGH DENSITY POLYETHYLENE MATERIAL FURNISHED ACCORDING TO THIS SECTION.

D. THE LINER THICKNESS SHALL BE BASED ON THE FOLLOWING PHYSICAL CONDITIONS OF THE EXISTING SANITARY SEWER PIPE.

(1) PIPES SHALL BE CONSIDERED FULLY DETERIORATED.

(2) PIPES SHALL BE SUBJECT TO FULL SOIL LOAD OF 120 POUNDS/CF, APPLICABLE LIVE LOAD, AND WATER TABLE 5 FEET BELOW GROUND.

(3) PIPES SHALL BE CONSIDERED TO HAVE A MINIMUM OF 2 PERCENT OVALITY IN THE CIRCUMFERENCE.

E. ACCEPTABLE FOLD AND FORM PROCESSES SHALL BE "U-LINER PIPE," "NUPIPE," AND "ULTRALINER" AND SHALL BE FURNISHED AND INSTALLED BY A LICENSED CONTRACTOR OF THE RESPECTIVE PROCESS.

F. SEALS BETWEEN FOLDED AND FORMED LINER AND HOST PIPE SHALL BE MADE USING A HYDROPHILIC WATER SEALING MATERIAL SUCH AS HYDROTITE BY GREENSTREAK OR APPROVED EQUAL.

3. EXECUTION

3.01 THE REHABILITATION OF THE SEWER MAIN SHALL BE PERFORMED WITHOUT THE NEED FOR EXCAVATION OR DEMOLITION OF EXISTING STRUCTURES, AND BE ABLE TO RE-ESTABLISH USER LATERAL SERVICES WITHOUT EXCAVATION AND MINIMIZE THE DISRUPTIONS TO NEIGHBORING HOMES AND TRAFFIC. EXCAVATION FOR POINT REPAIRS OR EMERGENCIES SHALL BE PERMITTED, BUT ONLY AS REQUIRED AND DIRECTED BY THE ENGINEER.

3.02 THE FINISHED LINING SHALL BE JOINTLESS AND CONTINUOUS OVER THE ENTIRE LENGTH OF AN INSERTION RUN BETWEEN THE STARTING AND TERMINATING MANHOLES AND BE AS FREE AS COMMERCIALLY PRACTICABLE FROM VISUAL DEFECTS SUCH AS FOREIGN INCLUSIONS, DRY SPOTS, PINHOLES, AND DELAMINATIONS. IF THE PROPOSED METHOD OF INSERTING THE LINER REQUIRES THE MODIFICATION OF A

MANHOLE, THE COST TO MODIFY AND REPAIR THE MANHOLE SHALL BE INCLUDED IN THE BID.

3.03 PRE-INSERTION CLEANING: CLEAN THE EXISTING SEWER PIPE IMMEDIATELY BEFORE THE PRE-INSERTION TELEVISION INSPECTION.

3.04 PRE-INSERTION TELEVISION INSPECTION: VIDEO (TV) THE SEWER PIPE IMMEDIATELY BEFORE THE INSERTION OF THE LINER, TO ASSURE THAT THE PIPE IS CLEAN AND EXISTING PIPE CONDITIONS ARE ACCEPTABLE FOR LINING.

3.05 BYPASSING SEWAGE: PROVIDE FOR CONTINUOUS SEWAGE FLOW AROUND THE SECTION(S) OF PIPE DESIGNATED FOR THE INSERTION OF LINERS AND SERVICE LATERALS CONNECTING TO THESE SECTIONS OF PIPE. THE PUMP BYPASS LINES SHALL BE OF ADEQUATE CAPACITY AND SIZE TO HANDLE THE FLOW IN ACCORDANCE WITH PROVISION OF RELEVANT SECTIONS IN THESE SPECIFICATIONS.

3.06 LINE OBSTRUCTIONS: IF PRE-INSERTION VIDEO (TV) INSPECTION REVEALS AN OBSTRUCTION IN THE EXISTING PIPE (SUCH AS HEAVY SOLIDS, DROPPED JOINTS, PROTRUDING SERVICE TAPS, OR COLLAPSED PIPE WHICH WILL PREVENT COMPLETION OF THE LINING PROCESS) THAT CANNOT BE REMOVED BY CONVENTIONAL SEWER CLEANING EQUIPMENT, THEN A POINT REPAIR SHALL BE MADE BY THE CONTRACTOR AT THE DIRECTION OF THE ENGINEER.

3.07 THE CURED-IN-PLACE LINER SHALL BE INSTALLED AS FOLLOWS:

A. WET OUT: THE CONTRACTOR SHALL DESIGNATE A LOCATION WHERE THE LINER SHALL BE IMPREGNATED ("WETTED OUT") WITH RESIN TO THOROUGHLY SATURATE THE LINER PRIOR TO INSTALLATION. THE CONTRACTOR SHALL INFORM THE ENGINEER IN ADVANCE TO INSPECT THE MATERIALS AND THE WET OUT PROCEDURE.

B. INSERTION: THE WETTED OUT TUBE SHALL BE TRANSPORTED AND KEPT IN A STABLE STATE UNTIL IT IS INSERTED THROUGH AN EXISTING MANHOLE BY APPROVED TECHNIQUES/PROCESS OF THE CONTRACTOR. THE INSERTION AREA, EQUIPMENT PLATFORM, ETC. SHALL BE SECURELY PROTECTED, AND ALL DAMAGED YARDS, DRIVEWAYS, WALKS, ETC. SHALL BE REPAIRED, AT NO COST TO THE OWNER.

C. CURING: AFTER THE INSERTION IS COMPLETED, THE CONTRACTOR SHALL USE A HEAT SOURCE TO UNIFORMLY HEAT THE LINER TO CURE THE RESIN IN THE LINER. THE CURING TEMPERATURES SHALL BE AS RECOMMENDED BY THE RESIN/CATALYST SYSTEM OF THE RESIN MANUFACTURER. THE HEAT SOURCE SHALL BE FITTED WITH SUITABLE MONITORS TO GAGE THE TEMPERATURE OF THE INCOMING AND OUTGOING HEAT SOURCE. INITIAL CURE MAY BE CONSIDERED COMPLETED WHEN THE EXPOSED PORTIONS OF THE LINER APPEAR TO BE HARD, AND THE REMOTE SENSING DEVICE INDICATES THE TEMPERATURES TO BE ADEQUATE, AS RECOMMENDED BY THE RESIN/CATALYST SYSTEM MANUFACTURER. CURING TEMPERATURES AND DURATION SHALL COMPLY WITH PREVIOUSLY SUBMITTED DATA AND INFORMATION.

D. FINISHED PIPE: THE FINISHED CIPP SHALL BE CONTINUOUS OVER THE ENTIRE LENGTH FROM MANHOLE TO MANHOLE AND BE FREE FROM VISUAL DEFECTS SUCH AS FOREIGN INCLUSIONS, DRY SPOTS, KEEL, BOAT HULL, PINHOLES, WRINKLES, AND OTHER DEFORMITIES. THE LINER PASSING THROUGH OR TERMINATING IN A MANHOLE SHALL BE CAREFULLY CUT OUT IN A SHAPE AND MANNER APPROVED BY THE ENGINEER. THE INVERT AND BENCHES SHALL BE STREAMLINED AND IMPROVED FOR SMOOTH FLOW. THE AREA/ANNULAR SPACE BETWEEN EXISTING AND THE CIPP SHALL BE SEALED.

E. SEALING AND BENCHES IN MANHOLE: THE CIPP SHALL MAKE A TIGHT FITTING SEAL WITH THE EXISTING PIPE(S) IN THE MANHOLE. A 1/2-INCH DIAMETER ACTIVATED OAKUM BAND SOAKED IN SCOTCH SEAL 5600 OR EQUAL SHALL BE APPLIED CIRCUMFERENTIALLY NEAR THE ANNUAL SPACE TOUCHING THE END OF EXISTING PIPE AND ENCASED WITH A CEMENTITIOUS MORTAR. TOP HALF OF THE PIPE SHALL BE NEATLY CUT OFF AND NOT BROKEN OR SHEARED OFF, AT LEAST 4 INCHES AWAY FROM THE WALLS. THE CHANNEL IN THE MANHOLE SHALL BE A SMOOTH CONTINUATION OF THE PIPE(S) AND SHALL BE MERGED WITH OTHER LINES OR CHANNELS, IF ANY. CHANNEL CROSS-SECTION SHALL BE U-SHAPED WITH A MINIMUM HEIGHT OF HALF PIPE DIAMETER, TO THREE-FOURTHS OF THE PIPE DIAMETER FOR 15 INCHES AND LARGER. THE SIDE OF THE CHANNELS SHALL BE BUILT UP WITH MORTAR/CONCRETE TO PROVIDE BENCHES AT A MAXIMUM OF 1 IN 12 PITCH TOWARDS THE CHANNEL.

3.08 THE FOLD AND FORM LINER SHALL BE INSTALLED AS INDICATED BELOW:

A. THE LINER SHALL BE INSERTED INTO THE EXISTING SEWER LINE WITH A POWER WINCH AND STEEL CABLE CONNECTED TO THE END OF THE LINER BY USE OF AN APPROPRIATE PULLING HEAD. A SECOND PULLING HEAD MAY BE ATTACHED TO THE OTHER END OF THE LINER FOR ATTACHMENT OF A TAG LINE TO PULL THE LINER BACK OUT OF THE SEWER LINE, IF NECESSARY. LENGTH OF THE LINER PIPE TO BE INSERTED AT ANY ONE TIME SHALL BE GOVERNED BY THE WINCH DRUM CAPACITY AND WINCHING POWER AVAILABLE AND CONSIDERATION OF THE SIZE AND CONDITION OF THE SEWER. DURING INSERTION, PRECAUTIONS SHOULD BE TAKEN TO PROTECT THE LINER PIPE TO PREVENT SCORING THE OUTSIDE OF THE LINER AS IT IS BEING PULLED INTO THE SEWER.

B. REFORMING: AFTER INSERTION IS COMPLETED, THE CONTRACTOR SHALL SUPPLY A SUITABLE HEAT/PRESSURE SOURCE AND WATER RECIRCULATION EQUIPMENT. THE EQUIPMENT SHALL BE CAPABLE OF DELIVERING HOT WATER/PRESSURE THROUGHOUT THE SECTION TO UNIFORMLY RAISE THE WATER TEMPERATURE ABOVE THE TEMPERATURE REQUIRED TO REFORM THE LINER.

C. THE HEAT SOURCE SHALL BE FITTED WITH SUITABLE MONITORS TO GAGE THE TEMPERATURE OF THE INCOMING AND OUTGOING WATER SUPPLY.

D. THE CONTRACTOR SHALL COOL THE LINER TO A TEMPERATURE BELOW 100 DEGREES F BEFORE RELIEVING THE REFORMING PRESSURE. COOL-DOWN MAY BE ACCOMPLISHED BY THE INTRODUCTION OF COOL WATER OR OTHER APPROVED METHOD INTO THE RECIRCULATION NETWORK.

E. FINISH: THE FINISHED LINER SHALL BE CONTINUOUS OVER THE ENTIRE LENGTH OF THE INSERTION AND BE AS FREE AS COMMERCIALLY PRACTICABLE FROM VISUAL DEFECTS SUCH AS FOREIGN INCLUSIONS.

F. SEALING LINER AT MANHOLES: SEALS BETWEEN FOLDED AND FORMED LINER AND HOST PIPE SHALL BE MADE USING A HYDROPHILIC WATER SEALING MATERIAL SUCH AS HYDROTITE BY GREENSTREAK OR APPROVED EQUAL.

3.09 SERVICE RECONNECTIONS: THE EXACT LOCATION AND NUMBER OF SERVICE CONNECTIONS SHALL BE DETERMINED FROM TV TAPES AND/OR IN THE FIELD. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ACCURATELY FIELD LOCATE ALL EXISTING SERVICE CONNECTIONS. THE CONTRACTOR SHALL RECONNECT ALL SERVICE CONNECTIONS TO THE LINER PIPE. THE CONTRACTOR SHALL RESTORE/CORRECT WITHOUT ANY DELAY, ALL MISSED OR FAULTY RECONNECTIONS, AS WELL AS FOR ANY DAMAGE CAUSED FOR NOT RECONNECTING THE SERVICES SOON ENOUGH. ALL SERVICES WHICH ARE RECONNECTED TO REHABILITATED LINER SHALL BE SHOWN ON THE "RECORD DRAWINGS" WITH THE EXACT DISTANCE FROM THE NEAREST UPSTREAM/DOWNSTREAM MANHOLE. ALL EXISTING SERVICE CONNECTIONS SHALL BE RECONNECTED BY REMOTE TV CONTROLLED CUTTING DEVICE METHOD.

A. SERVICE CONNECTION BY REMOTE CUT

(1) SERVICE CONNECTIONS SHALL BE DONE BY TV CONTROLLED REMOTE CUTTING DEVICE. THEY SHALL BE MADE BY EXPERIENCED OPERATORS SO THAT NO BLIND ATTEMPTS OR HOLES ARE MADE IN THE LINER. LOCATION SHALL BE REVERIFIED CAREFULLY WITH EARLIER TAPES FOR ACCURACY SPECIALLY WHERE DIMPLES ARE NOT DEFINED OR CLEARLY ASCERTAINED. THE ENGINEER RESERVES THE RIGHT TO REQUIRE SERVICE CONNECTION BY EXCAVATION AT CERTAIN LOCATIONS, IF THE QUALITY, WORKMANSHIP, AND APPROVAL RATING FOR REMOTE CUT IS POOR AND NOT SATISFACTORY.

(2) THE REMOTE CUT SHALL BE SMOOTH AND CIRCULAR IN NATURE AS SEEN BY A 360-DEGREE TV CAMERA. THE HOLE SHALL BE A MAXIMUM OF 100 PERCENT AND A MINIMUM OF 90 PERCENT OF THE SERVICE PIPE DIAMETER. IT SHALL BE PROPERLY ALIGNED AND BE CONCENTRIC TO THE EXISTING CONNECTION. THE LOCATIONS OF ALL REMOTE CUTS SHALL BE VERIFIED CAREFULLY TO MATCH WITH EARLIER TAPES FOR THEIR EXACT LOCATIONS. EXCESS, WRONG HOLES, OR TRIAL CUTS SHALL NOT BE MADE AND SHALL BE REPAIRED AT NO COST TO THE OWNER. DEFECTIVE CONNECTIONS SHALL BE REPAIRED TO THE OWNER'S SATISFACTION AT NO EXTRA COST. IF A REMOTE CUT CONNECTION IS TO BE RECTIFIED OR REPLACED WITH CONNECTION "BY EXCAVATION," IT SHALL BE DONE AT NO ADDITIONAL COST TO THE OWNER.

3.10 TESTING FOR ACCEPTANCE: VIDEO (TV) INSPECTION IN ACCORDANCE WITH SECTION 02760 SHALL BE PROVIDED AFTER THE LINER HAS BEEN INSTALLED IN THE EXISTING SEWER PIPE. THE TELEVISING SHALL BE DONE AFTER ALL SERVICE CONNECTIONS HAVE BEEN MADE. PAYMENT FOR LINING OF SEWER LINES WILL NOT BE MADE UNTIL THE ENGINEER HAS REVIEWED THE POST-LINING VIDEO TAPE AND ACCEPTED THE LINING.

3.11 FAILURE OF STRUCTURAL REHABILITATION LINER: IF A LINER FAILS TO REFORM/CURE, THE CONTRACTOR SHALL BE REQUIRED TO REMOVE THE FAILED LINER AT NO ADDITIONAL COST. THE WORK SHALL INCLUDE ALL MATERIAL, EXCAVATION, BACKFILLING, CUTTING CONCRETE, PIPE SHORING, TEMPORARY PAVEMENT, PERMANENT PAVEMENT, AND OTHER INCIDENTAL WORK REQUIRED TO REMOVE THE LINER FROM THE EXISTING PIPE. THE ENGINEER SHALL APPROVE ALL METHODS TO BE USED PRIOR TO STARTING WORK ON THIS ITEM.

END OF SECTION

SECTION 02930 - SEEDING

1. GENERAL

1.01 REFERENCE SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS.....ASTM

1.02 SUBMITTALS: PROVIDE THE FOLLOWING IN A TIMELY MANNER IN ACCORDANCE WITH THE APPROVED SUBMITTALS SCHEDULE AS SPECIFIED IN DIVISION 1 - GENERAL REQUIREMEMTS

A. SUBMITTAL: FERTILIZER PRODUCT, DETAILED MANUFACTURER'S SPECIFICATION

B. SUBMITTAL: PERMANENT AND TEMPORARY SEEDING MIXES, MANUFACTURER'S SPECIFICATION

C. SUBMITTAL: TYPE II MULCH, PRODUCT SAMPLE AND SPECIFICATIONS

D. SUBMITTAL: TURF REINFORCEMENT MAT, PRODUCT SAMPLE, AND SPECIFICATIONS

1.02 MATERIALS SHALL BE DELIVERED IN UNBROKEN CONTAINERS, CLEARLY MARKED BY THE MANUFACTURER AS TO CONTENTS. SEED, LIMESTONE, AND FERTILIZER SHALL BE LABELED AS TO PROPORTIONS, ANALYSIS, AND QUALITY. STORE ALL MATERIALS IN A MANNER AFFORDING PROTECTION FROM DAMAGE BY WEATHER OR VANDALISM.

1.03 SEED ONLY WHEN WIND VELOCITY IS LESS THAN 15-MILES PER HOUR.

1.04 ALL SOIL AREAS DISTURBED BY THE CONTRACTOR DURING OR BY HIS CONSTRUCTION OPERATIONS SHALL BE PREPARED AND/OR SEEDED. WHENEVER THE DISTURBED AREA IS PART OF A RESIDENTIAL LAWN, IT SHALL BE HAND RAKED THUS REMOVING ROCKS AND CLODDED DIRT TO THE SATISFACTION OF THE ENGINEER AND THE PROPERTY OWNER. THE CONTRACTOR SHALL RESEED ANY AREAS WHERE A SUFFICIENT STAND OF GRASS IS NOT OBTAINED AS DETERMINED BY THE ENGINEER.

2. PRODUCTS

2.01 TOPSOIL SHALL BE THE TOP 6 INCHES OF ORIGINAL SOIL FROM THE SITE, UNLESS OTHERWISE NOTED ON THE DRAWINGS. TOPSOIL OBTAINED OFF-SITE SHALL BE FERTILE, FRIABLE LOAM, CONTAINING NOT LESS THAN 2 PERCENT BY WEIGHT OF FINELY DIVIDED, DECOMPOSED VEGETABLE MATTER. TOPSOIL SHALL BE FREE OF SUBSOIL, CLAY LUMPS, BRUSH, WEEDS, ROOTS LARGER THAN 1/2-INCH DIAMETER, STONES LARGER THAN 1/2 INCH DIAMETER, AND OTHER MATERIAL TOXIC OR HARMFUL TO GROWTH.

2.02 FERTILIZER SHALL MEET REQUIREMENTS OF FEDERAL SPECIFICATION O-F-241. PROVIDE FERTILIZER THAT IS COMPLETE, INORGANIC, UNIFORM IN COMPOSITION, AND SUITABLE FOR APPLICATION WITH APPROVED EQUIPMENT. PROPORTIONS OF CONTROLLED RELEASE FERTILIZER NUTRIENTS SHALL BE MULTIPLES OF THE FOLLOWING:

5 POUNDS OF ACTUAL NITROGEN
10 POUNDS OF ACTUAL PHOSPHATE
5 POUNDS OF ACTUAL POTASH
OR
10 POUNDS OF ACTUAL NITROGEN
20 POUNDS OF ACTUAL PHOSPHATE
10 POUNDS OF ACTUAL POTASH

2.03 SEED TESTED WITHIN 6 MONTHS OF SOWING, SHALL HAVE THE FOLLOWING CHARACTERISTICS:

A. PERMANENT SEEDING: CONDUCT BETWEEN MARCH 1 AND APRIL 1 OR BETWEEN AUGUST 25 THROUGH SEPTEMBER 15

DEVELOPED LOTS/LAWN AREAS:

SPECIES	PERCENTAGES (MINIMUM) WEIGHT	PURITY	GERMINATION
ENVIROSHADE SEED BLEND*	95	98	90
REED CANARYGRASS	5	85	75
ANNUAL RYE (NURSE PLANT)	40 LBS/ACRE		

UNDEVELOPED OFF ROAD AREAS:

SPECIES	PERCENTAGES (MINIMUM) WEIGHT	PURITY	GERMINATION
ENVIROSHADE SEED BLEND*	60	98	90
UNSCARIFIED SERICEA LESPEDEZA	20	85	75
KOBE LESPEDEZA OR CROWNVETCH	20	85	75
ANNUAL RYE (NURSE PLANT)	40 LBS/ACRE		

* OR APPROVED EQUAL ENVIROSHADE IS PRODUCED BY PENNINGTON SEED INCORPORATED

B. TEMPORARY SEEDING (OMIT LESPEDEZA IN DEVELOPED LOTS/LAWNS)

SEEDING DATE	SPECIES	PERCENTAGES (MIN.) WGT.	PURITY	GERM.	SEEDING RATE POUNDS PER ACRE
FEB 1 - MAY 1	ANNUAL RYE	70	98	85	120
	AND KOBE LESPEDEZA	30	98	85	50
MAY 1 - AUG 15	SMALL STEM SUDANGRASS	100	98	80	50
AUG 15 - NOV 15	ANNUAL RYE	100	96	85	140
NOV 15 - FEB 1	WINTER RYE	100	96	85	140

2.04 LIME SHALL BE GROUND AGRICULTURAL GRADE LIMESTONE CONTAINING NOT LESS THAN 85 PERCENT CALCIUM AND MAGNESIUM CARBONATES. FINENESS SHALL BE SUCH THAT

100 PERCENT WILL PASS A NO. 20 SIEVE, AND NOT LESS THAN 50 PERCENT WILL PASS A NO. 100 SIEVE. BURNT LIME, HYDRATED LIME, OR PELLETIZED LIME MAY BE SUBSTITUTED IN EQUIVALENT CARBONATES, IF REQUESTED.

2.05 TYPE I MULCH COMPOSED OF THRESHED STRAW OF CEREAL GRAIN OR WOOD FIBER SHALL BE FREE OF OBJECTIONABLE WEED SEEDS OR OTHER HARMFUL MATERIAL.

2.06 TYPE II MULCH SHALL BE "HOLD/GRO" EROSION CONTROL FABRIC MANUFACTURED BY GULF STATES PAPER CORPORATION OR "CURLEX" BLANKETS MANUFACTURED BY THE AMERICAN EXCELSIOR COMPANY. THESE PRODUCTS ARE ACCEPTABLE FOR VDOT EC-2.

2.07 TURF REINFORCEMENT MATTING (EC-3) SHALL MEET THE PERFORMANCE REQUIREMENTS SHOWN ON THE PROJECT PLANS, FOR EACH SPECIFIC APPLICATION.

2.08 ASPHALT ADHESIVE FOR USE WITH TYPE I MULCH SHALL BE EMULSIFIED ASPHALT MEETING REQUIREMENTS OF ASTM D 977, GRADE SS-1.

2.09 SYNTHETIC MULCH BINDER FOR USE WITH TYPE I MULCH: AEROSPRAY, PETROSET, OR TERRA TACK.

2.10 STAPLES FOR USE WITH MULCH BLANKET OR TURF REINFORCEMENT MAT SHALL BE THE MORE STRINGENT OF PLAIN IRON WIRE, NO. 8 GAGE OR HEAVIER, BE 6 INCHES OR MORE IN LENGTH, OR MANUFACTURERS PRODUCT RECOMMENDATIONS FOR THE SPECIFIC APPLICATION SHOWN ON THE PLANS.

3. EXECUTION

3.01 TEMPORARY SEEDING

A. RESTORE TOPSOIL TO ORIGINAL DEPTH OR 6 INCHES IN ACCORDANCE WITH SPECIFICATION SECTION 02220, PARAGRAPH 3.09(G).

B. USE IN AREAS WHEN FINAL GRADING HAS NOT BEEN COMPLETED OR WHEN PERMANENT SEEDING CANNOT BE DONE DUE TO THE SPECIFIED PERMANENT SEEDING DATES, OR PROJECT SEQUENCING REQUIRES DISTURBING THE AREA IN A SECONDARY PHASE OF WORK.

C. APPLY FERTILIZER AT A RATE OF 15 POUNDS OF 10-20-10 PER 1,000 SQUARE FOOT (600 POUNDS PER ACRE) OR EQUIVALENT.

D. APPLY LIME AT A RATE OF 50 POUNDS PER 1,000 SQUARE FEET.

E. FOR LOOSE SOIL, WORK LIME AND FERTILIZER INTO SOIL AND THEN SEED. FOR PACKED OR HARD SOIL, LOOSEN TOP LAYER WHILE WORKING LIME AND FERTILIZER INTO SOIL AND THEN SEED AT THE RATE REQUIRED FOR THE TEMPORARY SEEDING SPECIES.

3.02 PREPARE SOIL FOR PERMANENT SEEDING AND HYDROSEEDING BY TILLAGE OF TOPSOIL IN PLACE TO LOOSEN THOROUGHLY AND BREAK UP ALL CLODS TO A DEPTH OF 6 INCHES. REMOVE ALL STUMPS AND ROOTS, COARSE VEGETATION, STONES LARGER THAN 1-1/2 INCHES, AND ALL CONSTRUCTION DEBRIS. SOIL SHALL BE WORKED BY SUITABLE AGRICULTURAL EQUIPMENT TO A DEPTH OF NOT LESS THAN 4 INCHES. RAKE TO A UNIFORM, SMOOTH, AND DRAINABLE SURFACE.

A. APPLY LIME AND FERTILIZER UNIFORMLY AND MIX WELL INTO TOP 4 INCHES OF SEED BED. APPLY LIME AT THE RATE OF 100 POUNDS PER 1,000 SQUARE FEET. APPLY FERTILIZER AT THE EQUIVALENT RATE OF 35 POUNDS OF 10-20-10 PER 1,000 SQUARE FEET. RATES SHOULD BE ADJUSTED FOR OTHER GRADES OF FERTILIZER. USE CONTROLLED RELEASE FERTILIZER AND LIME.

3.03 SOW PERMANENT GRASS SEED BETWEEN DATES OF MARCH 1 AND APRIL 1 OR SEPTEMBER 1 AND OCTOBER 15.

3.04 SOW SEED BY MECHANICAL SEEDER AS FOLLOWS:

A. MIX SEED THOROUGHLY WITH CLEAN DRY SAWDUST AND BROADCAST AT RATE OF 10 POUNDS OF GRASS SEED PER 1,000 SQUARE FEET IN CROSS DIRECTIONS TO ENSURE UNIFORM DISTRIBUTION. RAKE SURFACE LIGHTLY AND ROLL WITH APPROPRIATE TYPE OF LAWN ROLLER WEIGHING MAXIMUM OF 150 POUNDS PER FOOT OF WIDTH TO IMBED SEED 0.25 INCH IN THE TOPSOIL SURFACE.

B. APPLY EITHER TYPE I OR TYPE II MULCH.

(1) TYPE I MULCH: APPLY UNIFORMLY AT THE FOLLOWING RATES:

STRAW - 70-90 POUNDS PER 1,000 SQUARE FEET

WOOD FIBER - 25-50 POUNDS PER 1,000 SQUARE FEET

(2) ANCHOR MULCH BY THE FOLLOWING METHODS:

APPLY LIGHT TACK COAT OF ASPHALT EMULSION (10 GALLONS PER 1,000 SQUARE FEET).

IN RESIDENTIAL AREAS, APPLY A SYNTHETIC MULCH BINDER AT RATE RECOMMENDED BY MANUFACTURER.

ON SLOPES STEEPER THAN 4 HORIZONTAL TO 1 VERTICAL, SECURE HEAVY JUTE MESH WITH STAPLES OVER TYPE I MULCH.

(3) TYPE II MULCH: APPLY ON SLOPES 3:1 OR STEEPER AND IN AREAS OF CONCENTRATED FLOW IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND AS SHOWN ON PROJECT PLANS.

3.05 SOW SEED BY HYDROSEEDING AS FOLLOWS:

A. MIX LIME, SEED, FERTILIZER, AND WOOD CELLULOSE FIBER IN REQUIRED AMOUNT OF WATER TO PRODUCE A HOMOGENEOUS SLURRY. HYDROSEEDING MIX SHALL INCORPORATE A 16-45-7 SEED STARTING FERTILIZER TO PROMOTE GERMINATION AT A RATE OF 35 POUNDS PER ACRE. THE ABOVE INGREDIENTS SHALL BE ADDED AND MIXED IN THE FOLLOWING ORDER: LIME AT 15 POUNDS PER ACRE, SEED AT 260 POUNDS PER ACRE, FERTILIZER AT 35 POUNDS PER ACRE, AND AMPLE WOOD CELLULOSE FIBER TO MAKE A SLURRY. ALL INGREDIENTS ARE TO BE DESIGNED FOR USE IN HYDROSEEDING OPERATIONS. AFTER THOROUGHLY MIXED, APPLY UNIFORMLY AT THE RATE OF 260 POUNDS OF GRASS SEED PER ACRE, DRY WEIGHT.

B. THE ABOVE MIXTURE SHALL BE APPLIED WITHIN 3.0 HOURS FROM THE TIME OF MIXING.

C. ALL MIXTURES SHALL BE CONSTANTLY AGITATED FROM THE TIME THEY ARE MIXED UNTIL THEY ARE APPLIED TO THE SEED BED.

D. IMMEDIATELY FOLLOWING THE APPLICATION OF THE SEED SLURRY MIX, MAKE SEPARATE APPLICATION OF WOOD CELLULOSE MULCH AT THE RATE OF 1,500 POUNDS, DRY WEIGHT, PER ACRE.

E. APPLY A TYPE II MULCH ON SLOPES 3:1 OR STEEPER IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

3.06 REMOVE ALL SOILING OR STAINING OF FINISHED WALKS, DRIVES, AND PARKING AREAS RESULTING FROM SEEDING WORK. MAINTAIN PAVED AREAS IN CLEAN CONDITION.

3.07 MAINTENANCE OF PERMANENT SEEDING

A. PROVIDE PERIODIC WATERING AS REQUIRED ASSISTING WITH VEGETATION ESTABLISHMENT.

B. RESEED AND MULCH SPOTS LARGER THAN 1 SQUARE FOOT, WHICH DO NOT, EXHIBIT A UNIFORM STAND OF GRASS WITHIN 6 WEEKS, PROVIDE ADDITIONAL TOPSOIL AS REQUIRED.

C. IN THE EVENT THAT GROWTH IS NOT ESTABLISHED BY FINAL PROJECT INSPECTION, CONTINUE THE SPECIFIED ATTENTION UNTIL STAND IS ACCEPTED BY THE ENGINEER.

D. CORRECT OR REPAIR ALL UNDUE SETTLING AS EVIDENCED BY COMPLAINTS RECEIVED WITHIN 1 YEAR AFTER FINAL INSPECTION.

END OF SECTION